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Effect of Implementing Tele-nursing Versus Traditional Nursing Program on Knowledge, Life Style Modification and Blood Pressure Control for Hypertensive Patients

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ABSTRACT

Background: Hypertension is the main cause of disability and mortality in the world. Although it is a preventable and treatable condition, it can lead to serious and life threatening complications. Therefore, Compliance with antihypertensive treatment and life style modification is very essential. **Aim of the study:** To evaluate the effect of implementing a tele-nursing versus traditional nursing program on knowledge, life style modification and blood pressure control for hypertensive patients. **Study design:** A quasi experimental research design was utilized in this study. **Setting:** This study was carried out at the medical outpatient clinics affiliated to Tanta University Hospitals. **Subjects**: A purposive sample of 200 hypertensive patients who attended the previous settings, divided into two equal groups. **Tools**: Three tools were used for data collection. Tool I: Structured questionnaire consisted of three parts. Tool II: The Hill-Bone Compliance Scale. Tool III: Patient's commitment to blood pressure measurement and healthy lifestyle practices, including two parts. **Results:** there was statistically significant improvement in total knowledge score, commitment to blood pressure measurement, and compliance with healthy life style score in both groups post intervention than before intervention, this improvement was higher among first (tele-nursing) group. Also, there was significant positive correlation between total score of healthy lifestyle practices and total knowledge score for both groups. **Conclusion:** Tele-nursing method was effective in enhancing patients' knowledge, adherence to antihypertensive medications and lifestyle modification for better control of blood pressure. **Recommendations:** The health policymakers should consider tele-nursing in actively managing hypertensive patients in all health settings.

Keywords: Tele-nursing, traditional, compliance, commitment, lifestyle.

Introduction

Hypertension is a public health issue contributing to high incidence of strokes and coronary heart diseases. It is one of the most crucial health problems and the most common vascular disease in developed and underdeveloped countries. It is known as the silent killer as it is usually diagnosed incidentally and in severe cases. This disease is the main cause of disability and is considered the most vital risk factor for mortality in the world. Although hypertension is a preventable and treatable condition, it can lead to serious and life threatening complications for the heart, kidney and brain which in most cases result in patient's disability (Kjeldsen , 2018; Chimberengwa et al., 2019 ;Das et al., 2021). Hypertension is defined according to the World Health Organization (WHO) as the elevation of pressure of the blood against the walls of the arteries. This makes the heart to work twice as much to circulate blood through the vessels. High blood pressure has elevated readings of systolic, diastolic or both readings. Systolic blood pressure occurs when the heart is contracting and diastolic blood pressure is when the heart is relaxing. Hypertension has three stages. Stage one means systolic blood pressure of 140 mmHg and Diastolic blood pressure of 90 mmHg or higher. Stage two means 160/100mmHg or higher. Stage three is considered as severe hypertension and means systolic blood pressure is greater than 180mmHg and diastolic blood pressure is greater than or equal to 110 mmHg (Oparil et al., 2018;WHO, 2020).

According to WHO (2021), 1.28 billion adults aged 30-79 years worldwide have hypertension, most (two-thirds) living in low- and middle-income countries, 46% of adults with hypertension are unaware that they have the condition. Less than half of adults (42%) with hypertension are diagnosed and treated. Hypertension is a major cause of premature death worldwide. Thus, one of the global targets for non-communicable diseases is to reduce the prevalence of hypertension by 33% between 2010 and 2030 (WHO, 2021).

Hypertension is a highly prevalent health problem in Egypt. However, data about its prevalence and awareness is very low. In Egypt (17.8 million) of the adult population have hypertension (BURDEN OF HYPERTENSION 2017). Hypertension incidence increases with aging, around 50% of Egyptians over the age of 60 years have hypertension (Hasan et al .,2014). There are two types of high blood pressure, primary hypertension and secondary hypertension. Primary blood pressure, is also known as essential hypertension as the cause is unknown. It might result from unhealthy lifestyle and aging. About 95% cases of hypertension diagnosed are essential. Secondary hypertension is caused by medications or any health problem such as diabetes mellitus and chronic kidney disease. Only 5% of hypertensive patients are diagnosed with secondary hypertension (Njambi et al , 2015; Mills et al., 2020).

As 95% of hypertensive cases are diagnosed as essential, it's crucial to identify its risk factors. It can be divided into two groups, the modifiable and un-modifiable risk factors. The un-modifiable factors are those that are beyond human control such as gender, age and family history. On the other hand, the modifiable risk factors are determined by lifestyle choice such as poor diet, excess weight gain, excess alcohol intake and smoking. These factors are the backbone of hypertension control and prevention (Njambi et al., 2015; Jain et al, 2020) . According to American Heart Association (2014), hypertension is a symptomless condition unless in severe cases, while “systolic of 180mmHg and diastolic of 110mmHg”. These symptoms may include severe headaches, anxiety, nose bleeding and shortness of breath (Dorans et al., 2018).

Compliance with antihypertensive treatment and life style modification can prevent complications of hypertension such as chest angina, heart attack, heart failure, stroke, blindness as well as kidney failure. Thus, WHO recommended regular measurement of blood pressure at home and initiation of treatment as early as possible for confirmed cases with adherence to antihypertensive medications for improving the management and diagnosis of high blood pressure (Njambi et al., 2015; Organia et al., 2019; WHO, 2021;).

Achieving and sustaining blood pressure (BP) control is a global challenge. Lifestyle modification is the first line of intervention for all hypertensive patients, but pharmacological treatment remains the cornerstone for disease management. Health care professionals must not only identify and treat patients with hypertension but also help the general population to promote a healthy lifestyle and preventive strategies to decrease the prevalence of hypertension (Alsaigh et al., 2018).

Lifestyle modification plays an essential role in reducing blood pressure and even preventing the development of hypertension in normal individuals. Life style modification recommended by the WHO and Egyptian guidelines as well as 2020 International Society of Hypertension Global Hypertension Practice Guidelines include weight reduction (if overweight), regular physical exercise such as a brisk walk (30–60 min/day) ≥5 days/week, reducing salt intake to <5 g of sodium chloride/day, encouraging a healthy diet (increasing fibers and limiting saturated fats), stopping smoking and alcohol consumption as well as minimizing stress (Alsaigh et al., 2018; Unger et al., 2020;WHO, 2021;).

Educating hypertensive patients for life style modifications includes various methods. One of the most efficient and supportive methods, with proved effectiveness, is tele-nursing. Tele-nursing refers to the use of phone conversation and information technology to provide nursing care at a distance to always keep patient in touch when they are out of hospital with best possible positive outcome. It is especially useful for hypertensive patients who have problems of far distance from health care clinics or have to wait a long time for visiting a doctor. Tele-nursing includes all kinds of nursing care and services that can be provided from distance and includes a wide range of communication technologies such as phone, fax, email, internet, and video clips to overcome time and distance obstacles and provide better nursing care (Abd Elgaphar et al., 2017; Flack et al., 2020;Mohsen et al., 2020;).

Significance of the study: Hypertension is a major cause of premature death worldwide. That's why, its prevention and management have become a public health priority, with 29% of the world's adult population projected to have hypertension by the year 2025 as recorded by WHO 2021. According to the American Tele-health Association (2018), tele-nursing is a tool for delivering nursing care remotely to improve efficiency and patient access to healthcare (Hasan et al., 2014; WHO, 2021; American Hospital Association, 2022). Thus, the aim of this study is to evaluate the effect of implementing a tele-nursing versus traditional nursing program on knowledge, life style modification and blood pressure control for hypertensive patients.

Aim of the study

To evaluate the effect of implementing a tele-nursing versus traditional nursing program on knowledge, life style modification and blood pressure control for hypertensive patients.

Subjects and method

Research design: A quasi experimental research design was utilized in this study and it is a non-random method is used to assign subjects to groups.

Research settings: This research was carried out at the medical outpatient clinics affiliated to Tanta University Hospitals.

Subjects: A purposive sample of 200 hypertensive patients who attended the previous settings and meeting the following criteria:

Patients between 35-65 years of age, positive history of hypertension (recorded in patients' file) and undergoing treatment with antihypertensive medication at least 1 year prior to the study or at least 2 blood pressures over 140/90 mmhg recorded in the vital signs sheet of the patients by staff nurses, attending the medical outpatient clinics, sufficient cognitive ability to use phones, no neurological or mental problems, no sight or hearing problems, oral communication ability, access to telephone technology and accept to participate in the study.

Then they were divided into two equal groups 100 patient in each. The first group was tele-nursing group and the second one was the traditional group.

Sample size:

The sample size was calculated using Epi-info 7 software program. The criteria for sample size selection were determined at 95% confidence limit, study power 80% with a 5% margin of error. The calculated sample size was found to be 150 patients and to be increased to 200 to increase the validity of the results.

Tool of data collection: Three tools were used by the researchers based on an evaluation of existing literature and delivered to patients through two ways, online and traditional method as follows

Tool I: Structured questionnaire: it was developed by the researcher based on recent and relevant literatures **(Faezeh et al,. 2019;Mohsen et al., 2020;).** It consisted of three parts as follows:-

Part 1:- Socio demographic data of the patients: Which contained data about patients age, sex, residence, marital status, education levels, occupation and family income.

Part 2:- Health history and family history of patients: which include history of suffering from any disease, type, duration of suffering from hypertension, taking prescribed medication regularly, current symptoms of hypertension ,blood pressure measurement, weight , height, BMI, smoking history, type and frequency **,** family medical history of hypertension and degree of relevance.

Part 3:- Patient`s knowledge about high blood pressure and a healthy lifestyle: It include definition, causes, risk factors, symptoms, complication, treatment and source of information.

The scoring system:

Each question in knowledge was checked and every correct answer was scored 1 and incorrect answer or don't know scored 0. The scores of correct answers of all questions were summed up. The total score of knowledge was (0-26), and then it was converted into percentage and divided as follows:

- Low < 60 % of the total score.
-Moderate 60-< 80 % of the total score.
-High ≥80 % of the total score.

Tool II:- The Hill-Bone Compliance to High Blood Pressure Therapy Scale : It was developed by **(Hill M, Bone L, Kim M, Levine D, 2000)** to assess patient behaviors in three important behavioral domains of high blood pressure treatment (the three sub-scales of the original scale): Appointment Keeping (3-items), Diet (2-items), Medication Adherence (9-items). The Compliance to High Blood Pressure Therapy Scale is now more commonly referred to as the Hypertension Adherence Scale. It consisted of 14-items. It was adapted by the researchers and translated into Arabic to measure the adherence to high blood pressure therapy. It was rated on a four point likert scale ranging from (4) always,(3)often, (2) sometimes and (1) never. These scores were summed up, converted into percentage and divided into:

- Low < 60 % of the total score.
-Moderate 60-< 80 % of the total score.
-High ≥80 % of the total score.

Tool III: Patient's commitment to healthy lifestyle practices:

It was developed by the researcher based on reviewed literature **(Josip et al., 2014; Mohsen et al., 2020)** and consisted of two parts:

Part 1:- Commitment to monitoring blood pressure: it consisted of seven statements. Each statement was scored 1 for yes answer and 0 for no. these scores were summed up, converted into percentage and divided as follows:

No Commitment <60% of the total score
Commitment≥60% of the total score

Part 2:- Commitment to healthy lifestyle practices: it consisted of 37 statements covering: antihypertensive medication 10 statements, healthy diet 13 statements, Exercise and improve the lifestyle 7 statements, reducing psychological stress 7 statements.

The scoring system of overall Healthy lifestyle practices: - A three point likert scale was used: never (3), often (2), always(1) for each statement, scores were summed up to calculate the total score, then converted into percent and classified into:

-Unsatisfactory <60% of the total score.
- Satisfactory ≥ 60% of the total score.

Method

-Official letter to conduct the study was obtained from the Faculty of Nursing to the responsible authorities (directors of previous settings) to obtain their approval and cooperation to carry out the study.

-Tool I and tool III of the study were developed by the researcher based on literature review. Tools II was adapted by the researcher.

-Content validity: All tools were tested for content validity by 5 experts in the field of medical surgical nursing and community health nursing specialists, 1 medical staff, and 1 medical biostatistics.

-Tool I and III was tested for a reliability using Cronbach's Alpha test. It was α= 0.975.

-A pilot study was carried out on 10% of the study groups to test the clarity, and applicability of the different items of the developed tools, and the pilot study sample was excluded from the study.

-The collection of data continued during a period from September 2021 to end of the January 2022.

The actual study

The program was provided by the researcher to ensure providing complete, consistent and accurate knowledge about hypertension disease and how to control it for the study group through two methods:

-The first was the traditional method as the researcher met the patients at previously mentioned settings 3 days/week based on appropriate that were detected by previous settings managers.

The second method was using technology as an online sheet google form to collect data and provide health education through zoom application (tele health education).

Developing and implementation program: this was done according to the following phases:

I) Assessment phase: (pretest) :.the data was collected by the previously mentioned tools through giving each studied patients questionnaire to collect the baseline data as a pre-intervention assessment.

II) Planning and Implementation phases:- after identifying the needs of patients in the assessment phase, the researchers developed nursing educational program about patients knowledge, life style and control measures regarding hypertension. It emphasized the areas of deficit in knowledge about hypertension disease: definition, risk factors, causes, signs and symptoms, prevention, and management.

For the online method, health education was provided through zoom application (tele health education). The program was divided on four online zoom sessions. The educational program sessions were carried out with the duration of each session approximately 30- 45 minutes. The educational program was conducted by using online group discussion with the studied patients, answering their questions and providing explanation. Teaching materials were included power point presentation, and videos.

For the tradition method, the program was divided in to six sessions; the average time of each session was 30–45 minutes. The handout was distributed on the studied patients. It was written in a simple language and supplemented by photos and illustrations to help the studied patients in the understanding of the content simply.

III) Evaluation phase:-This evaluation was conducted on the studied patients two times; first time (pre-test): before the teaching program implementation (using all parts of a tool) for the patients who were being researched, and second time: (post-test) three months after the teaching program implementation by using tool II and III only.

Statistical analysis:

Data was analyzed using IBM SPSS software package version 20.0**.** Qualitative data were described using number and percent. Quantitative data were described using mean and standard deviation .The Kolmogorov-Smirnov test was used to verify the normality of distribution. **Chi-square test** was used for categorical variables, to compare between different groups. **Fisher's Exact or Monte Carlo correction,** correction for chi-square when more than 20% of the cells have expected count less than 5. **Mann Whitney test** for abnormally distributed quantitative variables, to compare between two studied groups. **Wilcoxon signed ranks test** for abnormally distributed quantitative variables, to compare between two periods. **Pearson coefficient t**o correlate between two normally distributed quantitative variables**. Kruskal Wallis** test for abnormally distributed quantitative variables, to compare between more than two studied groups **(Kirkpatrick & Feeney, 2013)**

Results:

Table 1: represents distribution of the studied groups according to their socio demographic characteristics. It reveals that the age of telenursing group ranged between 30-79 years, while it was 29-79 years for traditional group. The highest percentage of both groups were ≥60 years old (66% and 39% respectively). About three fifths of both groups were females (66%, 58% respectively). Two fifth of the telenursing group and more than half (58%) of the traditional group were married.

Regarding place of residence, most of telenursing group (70%) were from urban area, compared to 40% of traditional group. Also, the highest proportion of both groups had secondary education (51%, 34% respectively). Moreover, 23% of telenursing group compared with 39% of traditional group were housewives or don't work. Family monthly income was enough for 33% and 47% of both groups respectively. There was no significant difference between both groups regarding sociodemographic characteristics except age, place of residence and educational level.

Table 2: represents distribution of studied groups according to their health history. It indicated that diabetes mellitus and heart disease were the highest prevalent diseases among both groups, telenursing group (60% and 55% respectively) and traditional group (43%, 44% respectively). Half of the first group suffered from hypertension since 5-<10years compared to only 22% of the second group. The highest percentage of both groups suffered from recurrent pain in head (87%, 79% respectively). Most of both groups (78%, 74% respectively) weren't smoking. Regarding BMI, most of both groups (80%, 74% respectively) were obese.

Table 3: represents distribution of the studied groups according to their family health history. It revealed that more than half of telenursing and traditional groups (59%, 52% respectively) had family history of high blood pressure. The highest proportion of both groups (79.7%, 58.8% respectively) stated that their fathers had hypertension. Additionally, it was found that, half of the telenursing group(49%), compared to 66% of traditional group reported taking the prescribed medications regularly. Regarding the reasons for your non-compliance with treatment, forgetness was the most common reason for both groups (41.2%, 61.8% respectively).

Table 4: represents Comparison between the two studied groups according to total knowledge score about high blood pressure and a healthy lifestyle. There was significant improvement of total knowledge score from pre to post intervention for both groups ($<0.001^*$). Pre-intervention, only 10% of the first group and 28% of the second group had good knowledge score. Meanwhile, post intervention, these percentages improved to 26% and 59% respectively. There was significant difference between both groups ($<0.001^*$).

Table 5: represents Comparison between the two studied groups according to source of information about high blood pressure. It was revealed that relatives and neighbors was the most prevalent source of information for both groups (67%, 52% respectively), followed by TV (13%, 45% respectively) , and the internet (12%, 45% respectively), with statistically significant difference between both groups ($<0.001^{*)}$.

Table 6: represents Comparison between the two studied groups according to their adherence to the treatment of high blood pressure (total score of hill-bone scale). It illustrated that, there was significant

improvement of total score of hill-bone scale from pre intervention to post intervention for both groups (<0.001*). As the majority (81%) of telenursing group and more than half (53%) of traditional group had poor adherence to treatment before intervention. These percentages reduced to (9%, 26% respectively) post intervention. Also, there was statistically significant difference between both groups (<0.001*).

Table 7: represents Comparison between the two studied groups according to their commitment to blood pressure measurement and healthy lifestyle practices scores. It was found that, the vast majority (92%) of the first group, and 76% of the second group reported no commitment to blood pressure measurement before intervention. Meanwhile, 87% and 73% of both groups respectively were committed post intervention. There was statistically significant improvement in commitment to blood pressure measurement for both groups from pre to post intervention (<0.001*). The same table indicated that, There was statistically significant improvement of total score of healthy lifestyle practices for both groups from pre intervention to post intervention (59.84±7.79, 74.99±8.79) and (66.86±8.88, 81.53±9.40) respectively. Also, there was statistically significant difference between both groups(<0.001*).

Table 8: represents correlation between healthy lifestyle practices to control blood pressure, hill bone scale score and total knowledge score of the studied groups post intervention. It was revealed that there was significant positive correlation between total score of healthy lifestyle practices and their total knowledge score for both groups (r=0.215*, p=0.032*) and (r=0.294*, p=0.003*) respectively. Also, Total score of healthy lifestyle practices was positively correlated with hill-bone scale score significantly for both groups (r=0.629*, p=<0.001*) and (r=0.212*, p=0.034*) respectively.

Table 9: represents relation between total knowledge score of the studied groups and their socio demographic characteristics. A statistically significant relation was found between total knowledge score and sex, marital status for both groups pre-intervention, while between total knowledge score and educational level for both groups post intervention (^{MC}p<0.001*), (^{MC}p=0.025*) respectively. Meanwhile, there was statistically significant relation between total knowledge score and family monthly income pre and post intervention for the telenursing group only (<0.001*), (0.023*) respectively.

Table 10: represents relation between total practice score of the studied groups and their socio demographic characteristics. It indicated that, there was A statistically

significant relation was found between total practice score and residence (0.007*), (0.005*), occupation (0.005*), *(0.002*) and family monthly income (<0.001*), *(0.001*) respectively for both groups post intervention. There was also significant relation with educational level for tele-nursing group pre-intervention *(^{MC}p <0.001*).

Table 11: represents relation between health history and mean systole and diastole blood pressure. It illustrated that, there was statistically significant relation between duration of suffering from high blood pressure and mean systole and diastole blood pressure for both groups. Meanwhile, there was no significant relation with family history of hypertension, taking prescribed medications, BMI, and smoking.

Table (1): Distribution of the studied groups according to their socio demographic characteristics

Socio demographic characteristics	Tele-nursing (n = 100)		Traditional (n = 100)		Test of Sig.	P
	No.	%	No.	%		
Age (years)						
<40	4	4.0	9	9.0	$\chi^2=$ 15.142*	0.002*
40–<50	10	10.0	21	21.0		
50–<60	20	20.0	31	31.0		
≥60	66	66.0	39	39.0		
Range	30.0 – 79.0		29.0 – 79.0		U= 3420.5*	<0.001*
Mean ± SD.	61.37 ± 12.32		55.11 ± 11.98			
Sex						
Male	34	34.0	42	42.0	$\chi^2=$ 1.358	0.244
Female	66	66.0	58	58.0		
Marital status						
Single	14	14.0	8	8.0	$\chi^2=$ 4.123	0.248
Married	40	40.0	53	53.0		
Widow	28	28.0	25	25.0		
Divorced	18	18.0	14	14.0		
Place of residence						
Rural	30	30.0	60	60.0	$\chi^2=$ 18.182*	<0.001*
Urban	70	70.0	40	40.0		
Educational level						
Illiterate or read and write	11	11.0	33	33.0	$\chi^2=$ 16.526*	0.001*
Primary education	17	17.0	20	20.0		
Secondary education	51	51.0	34	34.0		
University education or more	21	21.0	13	13.0		
Occupation						
Housewife/ I don't work	23	23.0	39	39.0	$\chi^2=$ 9.320*	0.054
Administrative job	27	27.0	16	16.0		
Vocational job	23	23.0	24	24.0		
Free business	19	19.0	11	11.0		
Craft job	8	8.0	10	10.0		
Family monthly income						
Enough	33	33.0	47	47.0	$\chi^2=$ 4.211	0.122
Not enough	50	50.0	38	38.0		
Enough and save it	17	17.0	15	15.0		

SD: **Standard deviation** χ^2: **Chi square test** **U: Mann Whitney test**
p: p value for comparing between the studied groups
*: Statistically significant at $p \le 0.05$

Table (2): Distribution of studied groups according to their health history:

Part Two: A. Patient's health history	Tele-nursing (n = 100)		Traditional (n = 100)		Test of Sig. χ^2	P
	No.	%	No.	%		
Do you suffer from any of these diseases? #						
Diabetes mellitus	60	60.0	43	43.0	5.785*	0.016*
Heart disease	55	55.0	44	44.0	2.420	0.120
Obesity	35	35.0	29	29.0	0.827	0.363
Anemia	41	41.0	29	29.0	3.165	0.075
Kidney diseases	15	15.0	21	21.0	1.220	0.269
Mention other	0	0.0	20	20.0	22.222*	<0.001*
No diseases	1	1.0	1	1.0	0.000	^{FE}p=1.000
How long have you been suffering from high blood pressure? (years)						
<5	8	8.0	33	33.0	31.047*	<0.001*
5 – <10	50	50.0	22	22.0		
10 – <20	39	39.0	34	34.0		
≥20	3	3.0	11	11.0		
Current symptoms of high blood pressure #						
Recurrent pain in the head	87	87.0	79	79.0	2.268	0.132
Dizziness and loss of consciousness	25	25.0	32	32.0	1.202	0.273
Lethargy and laziness	83	83.0	51	51.0	23.157*	<0.001*
Constant feeling of fatigue and stress	71	71.0	49	49.0	10.083*	0.001*
Heart rate faster than normal	53	53.0	39	39.0	3.945*	0.047*
Mention other	0	0.0	1	1.0	1.005	^{FE}p=1.000
Do you currently smoke?						
Yes	22	22.0	21	21.0	χ^2=5.010*)	(^{MC}p=0.026*)
no	78	78.0	74	74.0		
I was smoking and stopped	0	0.0	5	5.0		
If yes, what type of smoking?	(n = 22)		(n = 26)		χ^2=6.452*	^{MC}p=0.044*
Cigarettes	5	22.7	14	53.8		
Shisha	12	54.5	11	42.3		
Cigarettes and Shisha	5	22.7	1	3.8		
BMI	2	2.0	3	3.0	χ^2=1.107	^{MC}p=0.619)
Normal <18.5- <25	18	18.0	23	23.0		
Overweight 25-<30	80	80.0	74	74.0		
Obese ≥30						
Min. – Max	23.05– 75.56		23.05 – 58.82		U=3486.0*	(<0.001*)
Mean ± SD.	41.47 ± 11.19		35.70 ± 8.16			

SD: **Standard deviation** **U: Mann Whitney test** χ^2: **Chi square test**
MC: **Monte Carlo** FE**: Fisher Exact**
p: p value for comparing between the studied groups
*: Statistically significant at p ≤ 0.05 #: More than one answer

Table (3): Distribution of the studied groups according to their family health history and history of compliance with blood pressure treatment.

Do you take prescribed blood pressure medication regularly?					
Yes	49	49.0	66	66.0	χ^2= 5.913* (0.015*)
No	**51**	**51.0**	**34**	**34.0**	
What are the reasons for your non-compliance with treatment?	**(n = 51)**		**(n = 34)**		
I don't know	0	0.0	1	2.9	χ^2=24.704* (^{MC}p <0.001*)
Neglect	0	0.0	3	8.8	
Forget	21	41.2	21	61.8	
Hapless	15	29.4	6	17.6	
Bad taste	0	0.0	1	2.9	
Busy daily activity	15	29.4	0	0.0	
Not believe about medication	0	0.0	1	2.9	
Regular	0	0.0	1	2.9	

χ^2: Chi square test MC: Monte Carlo *: Statistically significant at $p \leq 0.0$

Table (4): Comparison between the two studied groups according to total knowledge score about high blood pressure and a healthy lifestyle

Total knowledge score about high blood pressure and a healthy lifestyle	Tele-nursing (n = 100)				Traditional (n = 100)				Test of sig. (p_1)	Test of sig. (p_2)
	Pre		Post		Pre		Post			
	No.	%	No.	%	No.	%	No.	%		
Low <60%	67	67.0	2	2.0	27	27.0	4	4.0	χ^2=32.665* (<0.001*)	χ^2=24.991* (<0.001*)
Moderate 60 –<80%	23	23.0	72	72.0	45	45.0	37	37.0		
High ≥80%	10	10.0	26	26.0	28	28.0	59	59.0		
Total score(0–8)										
Min. – Max.	2.0 – 7.0		4.0 – 8.0		1.0 – 8.0		4.0 – 8.0		**U**=2468.0* (<0.001*)	**U**=3147.0* (<0.001*)
Mean ± SD.	3.94 ± 1.69		6.0 ± 0.83		5.52 ± 1.49		6.62 ± 1.03			
Z(p_0)	7.695* (<0.001*)				5.605* (<0.001*)					

χ^2: **Chi square test** MC: **Monte Carlo**
SD: **Standard deviation** **U: Mann Whitney test** Z: **Wilcoxon signed ranks test**
p_0: p value for comparing **pre** and **post** in each other group
p_1: p value for comparing between the studied groups in **pre** period
p_2: p value for comparing between the studied groups in **post** period
*: Statistically significant at $p \leq 0.05$

Table (5): Comparison between the two studied groups according to source of your information about high blood pressure

Source of your information about high blood pressure?	Tele-nursing (n = 100)		Traditional (n = 100)		χ^2	p
	No.	%	No.	%		
A doctor or nurse	8	8.0	38	38.0	25.409*	<0.001*
Relatives and neighbors	67	67.0	52	52.0	4.669*	0.031*
TV	13	13.0	45	45.0	24.866*	<0.001*
The internet	12	12.0	45	45.0	26.721*	<0.001*
Mention other	0	0.0	2	2.0	2.020	^{FE}p=0.497

χ^2: **Chi square test** FE: **Fisher Exact**

Table (6): Comparison between the two studied groups according to their adherence to the treatment of high blood pressure (total score of hill-bone scale)

The total score of Hill-Bone scale	Tele-nursing (n = 100)				Traditional (n = 100)				Test of sig.(p_1)	Test of sig.((p_2)
	Pre		Post		Pre		Post			
	No.	%	No.	%	No.	%	No.	%		
Low <60%	81	81.0	9	9.0	53	53.0	26	26.0	χ^2=23.620* (<0.001*)	χ^2=12.919* (0.002*)
Moderate 60 –<80%	19	19.0	37	37.0	33	33.0	40	40.0		
High ≥80%	0	0.0	54	54.0	14	14.0	34	34.0		
Total score	**(14 – 56)**								U= 2969.0* (<0.001*)	U= 3690.50* (0.001*)
Min. – Max.	14.0 – 47.0		29.0 – 56.0		16.0 – 56.0		26.0 – 56.0			
Mean ± SD.	30.81±9.99		47.18±5.95		38.09±8.92		44.79±6.25			
Median	30.0		50.0		39.0		47.0			
Z(p_0)	8.553* (<0.001*)				5.230* (<0.001*)					

*: Statistically significant SD: **Standard deviation** **U: Mann Whitney test**
Z: **Wilcoxon signed ranks test** *: Statistically significant at $p \le 0.05$
p_0: p value for comparing **pre** and **post** in each other group
p_1: p value for comparing between the studied groups in **pre** period
p_2: p value for comparing between the studied groups in **post** period

Table (7): Comparison between the two studied groups according to their commitment to blood pressure measurement and healthy lifestyle practices:

The patient's commitment to blood pressure measurement/healthy life style score	Tele-nursing (n = 100)				Traditional (n = 100)				Test of sig.(p_1)	Test of sig.(p_2)
	Pre		Post		Pre		Post			
	No.	%	No.	%	No.	%	No.	%		
Commitment to blood pressure measurement score:										
No Commitment <60%	92	92.0	13	13.0	76	76.0	27	27.0	χ^2=9.524* (0.002*)	χ^2=6.125* (0.013*)
Commitment≥60%	8	8.0	87	87.0	24	24.0	73	73.0		
Total score	(0 – 7)									
Min. – Max.	0.0 – 6.0		3.0 – 6.0		0.0 – 7.0		2.0 – 7.0		U= 3424.50* (<0.001*)	U= 3260.0* (<0.001*)
Mean ± SD.	2.58 ± 1.51		5.31 ± 0.87		3.42 ± 1.76		5.79 ± 1.60			
Median	2.0		6.0		4.0		7.0			
Z(p_0)	7.882* (<0.001*)				6.414* (<0.001*)					
Overall Healthy lifestyle practices score										
Unsatisfactory <60%	95	95.0	54	54.0	79	79.0	19	19.0	χ^2=11.317* (0.001*)	χ^2=26.426* (<0.001*)
Satisfactory ≥60%	5	5.0	46	46.0	21	21.0	81	81.0		
Total score	(37 –111)									
Min. – Max.	45.0–81.0		54.0–95.0		49.0–91.0		56.0–99.0		U= 2761.50* (<0.001*)	U= 2894.50* (<0.001*)
Mean ± SD.	59.84±7.79		74.99±8.79		66.86±8.88		81.53±9.40			
Median	59.0		72.0		66.0		81.0			
Z(p_0)	8.622* (<0.001*)				8.326* (<0.001*)					

SD: **Standard deviation** **U: Mann Whitney test** Z: **Wilcoxon signed ranks test**
p_0: p value for comparing **pre** and **post** in each other group
p_1: p value for comparing between the studied groups in **pre** period

p_2: p value for comparing between the studied groups in **post** period *: Statistically significant at $p \leq 0.05$

Table (8): Correlation between healthy lifestyle practices to control blood pressure, hill bone scale score and total knowledge score of the studied groups

Post intervention		Total score of healthy lifestyle practices	
		Tele-nursing (n = 100)	Traditional (n = 100)
Total knowledge score	R	0.215*	0.294*
	P	0.032*	0.003*
hill bone scale score	R	0.629*	0.212*
	P	<0.001*	0.034*

r: Pearson coefficient
*: Statistically significant at $p \leq 0.05$

Table (9): Relation between total knowledge score of the studied groups and their socio demographic characteristics

Socio demographic characteristics	total knowledge score																							
	Tele-nursing (n = 100)												Traditional (n = 100)											
	Pre						Post						Pre						Post					
	Low (n=67)		Moderate (n = 23)		High (n = 10)		Low (n=2)		Moderate (n = 72)		High (n = 26)		Low (n=27)		Moderate (n = 45)		High (n = 28)		Low (n=4)		Moderate (n = 37)		High (n = 59)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Age (years)																								
<40	2	3.0	2	8.7	0	0.0	0	0.0	3	4.2	1	3.8	3	11.1	2	4.4	4	14.3	0	0.0	3	8.1	6	10.2
40–<50	5	7.5	3	13.0	2	20.0	0	0.0	7	9.7	3	11.5	3	11.1	15	33.3	3	10.7	3	75.0	9	24.3	9	15.3
50–<60	13	19.4	5	21.7	2	20.0	0	0.0	15	20.8	5	19.2	8	29.6	15	33.3	8	28.6	1	25.0	13	35.1	17	28.8
≥60	47	70.1	13	56.5	6	60.0	2	100	47	65.3	17	65.4	13	48.1	13	28.9	13	46.4	0	0.0	12	32.4	27	45.8
χ^2(^{MC}p)	**4.486 (0.583)**						**2.102 (1.000)**						**9.993 (0.119)**						**8.045(0.177)**					
Sex																								
Male	20	29.9	12	52.2	2	20.0	2	100	29	40.3	3	11.5	14	51.9	22	48.9	6	21.4	2	50.0	17	45.9	23	39.0
Female	47	70.1	11	47.8	8	80.0	0	0.0	43	59.7	23	88.5	13	48.1	23	51.1	22	78.6	2	50.0	20	54.1	36	61.0
χ^2(p)	**4.773(0.092)**						**10.840*(^{MC}p=0.003*)**						**6.817*(0.033*)**						**0.723(^{MC}p=0.718)**					
Marital status																								
Single	12	17.9	0	0.0	2	20.0	0	0.0	8	11.1	6	23.1	6	22.2	2	4.4	0	0.0	0	0.0	3	8.1	5	8.5
Married	25	37.3	11	47.8	4	40.0	1	50.0	27	37.5	12	46.2	12	44.4	30	66.7	11	39.3	4	100	19	51.4	30	50.8
Widow	20	29.9	8	34.8	0	0.0	0	0.0	25	34.7	3	11.5	8	29.6	9	20.0	8	28.6	0	0.0	11	29.7	14	23.7
Divorced	10	14.9	4	17.4	4	40.0	1	50.0	12	16.7	5	19.2	1	3.7	4	8.9	9	32.1	0	0.0	4	10.8	10	16.9
χ^2(^{MC}p)	**12.119*(0.043*)**						**8.460 (0.128)**						**19.408*(0.002*)**						**3.186(0.795)**					
Place of residence																								
Rural	20	29.9	6	26.1	4	40.0	1	50.0	20	27.8	9	34.6	19	70.4	28	62.2	13	46.4	3	75.0	23	62.2	34	57.

Urban	47	70.1	17	73.9	6	60.0	1	50.0	52	72.2	17	65.4	8	29.6	17	37.8	15	53.6	1	25.0	14	37.8	25	6 42.4
χ^2(MCp)	**0.645(0.724)**						**1.247 (0.569)**						**3.451 (0.178)**						**0.553(0.770)**					
Educational level																								
Illiterate or read and write	11	16.4	0	0.0	0	0.0	0	0.0	10	13.9	1	3.8	8	29.6	13	28.9	12	42.9	2	50.0	13	35.1	18	30.5
Basic education	11	16.4	6	26.1	0	0.0	1	50.0	16	22.2	0	0.0	6	22.2	10	22.2	4	14.3	1	25.0	13	35.1	6	10.2
High school education	24	35.8	17	73.9	10	100	1	50.0	32	44.4	18	69.2	8	29.6	16	35.6	10	35.7	1	25.0	9	24.3	24	40.7
University education or more	21	31.3	0	0.0	0	0.0	0	0.0	14	19.4	7	26.9	5	18.5	6	13.3	2	7.1	0	0.0	2	5.4	11	18.6
χ^2(p)	**27.991*(MCp<0.001*)**						**13.441*(MCp=0.015*)**						**3.366 (0.762)**						**12.694*(MCp=0.025*)**					
Occupation																								
Housewife/ I don't work	23	34.3	0	0.0	0	0.0	0	0.0	15	20.8	8	30.8	12	44.4	17	37.8	10	35.7	1	25.0	18	48.6	20	33.9
Administrative job	12	17.9	13	56.5	2	20.0	2	100	15	20.8	10	38.5	2	7.4	11	24.4	3	10.7	0	0.0	5	13.5	11	18.6
Vocational job	12	17.9	8	34.8	3	30.0	0	0.0	19	26.4	4	15.4	4	14.8	13	28.9	7	25.0	1	25.0	8	21.6	15	25.4
Free business	13	19.4	1	4.3	5	50.0	0	0.0	15	20.8	4	15.4	4	14.8	1	2.2	6	21.4	0	0.0	3	8.1	8	13.6
Craft job	7	10.4	1	4.3	0	0.0	0	0.0	8	11.1	0	0.0	5	18.5	3	6.7	2	7.1	2	50.0	3	8.1	5	8.5
χ^2(MCp)	**31.344*(<0.001*)**						**10.659(0.121)**						**14.085(0.071)**						**7.232 (0.443)**					
Family monthly income																								
Enough	20	29.9	7	30.4	6	60.0	0	0.0	21	29.2	12	46.2	12	44.4	23	51.1	12	42.9	3	75.0	19	51.4	25	42.4
Not enough	41	61.2	5	21.7	4	40.0	0	0.0	41	56.9	9	34.6	13	48.1	12	26.7	13	46.4	1	25.0	12	32.4	25	42.4
Enough and save it	6	9.0	11	47.8	0	0.0	2	100	10	13.9	5	19.2	2	7.4	10	22.2	3	10.7	0	.0	6	16.2	9	15.3
χ^2(MCp)	**21.272*(<0.001*)**						**9.665*(0.023*)**						**5.749 (0.216)**						**2.016 (0.728)**					

χ^2: **Chi square test** MC: **Monte Carlo** *: Statistically significant at $p \le 0.05$

Table (10): Relation between total practice score of the studied groups and their socio demographic characteristics

Socio demographic characteristics	Tele-nursing (n = 100)								Traditional (n = 100)							
	Pre				Post				Pre				Post			
	Unsatisfactory (n=95)		Satisfactory (n= 5)		Unsatisfactory (n=54)		Satisfactory (n= 46)		Unsatisfactory (n= 79)		Satisfactory (n= 21)		Unsatisfactory (n= 19)		Satisfactory (n= 81)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Age (years)																
<40	4	4.2	0	0.0	2	3.7	2	4.3	8	10.1	1	4.8	1	5.3	8	9.9
40–<50	9	9.5	1	20.0	6	11.1	4	8.7	15	19.0	6	28.6	2	10.5	19	23.5
50–<60	18	18.9	2	40.0	12	22.2	8	17.4	21	26.6	10	47.6	8	42.1	23	28.4
≥60	64	67.4	2	40.0	34	63.0	32	69.6	35	44.3	4	19.0	8	42.1	31	38.3
χ^2(^{MC}p)	**3.191 (0.353)**				**0.777(0.913)**				**6.230(0.083)**				**2.310 (0.513)**			
Sex																
Male	34	35.8	0	0.0	17	31.5	17	37.0	31	39.2	11	52.4	9	47.4	33	40.7
Female	61	64.2	5	100.0	37	68.5	29	63.0	48	60.8	10	47.6	10	52.6	48	59.3
χ^2(p)	**2.711 (^{FE}p=0.163)**				**0.332(0.565)**				**1.176 (0.278)**				**0.278(0.598)**			
Marital status																
Single	9	9.5	5	100.0	6	11.1	8	17.4	6	7.6	2	9.5	0	0.0	8	9.9
Married	40	42.1	0	0.0	22	40.7	18	39.1	40	50.6	13	61.9	11	57.9	42	51.9
Widow	28	29.5	0	0.0	15	27.8	13	28.3	22	27.8	3	14.3	4	21.1	21	25.9
Divorced	18	18.9	0	0.0	11	20.4	7	15.2	11	13.9	3	14.3	4	21.1	10	12.3
χ^2(p)	**16.752*(^{MC}p <0.001*)**				**1.084 (0.781)**				**1.853 (^{MC}p =0.653)**				**2.640(^{MC}p =0.457)**			
Place of residence																
Rural	25	26.3	5	100.0	10	18.5	20	43.5	46	58.2	14	66.7	6	31.6	54	66.7
Urban	70	73.7	0	0.0	44	81.5	26	56.5	33	41.8	7	33.3	13	68.4	27	33.3
χ^2(p)	**12.281*(^{FE}p=0.002*)**				**7.369*(0.007*)**				**0.492(0.483)**				**7.895*(0.005*)**			
Educational level																
Illiterate or read and write	7	7.4	4	80.0	6	11.1	5	10.9	26	32.9	7	33.3	1	5.3	32	39.5

Basic education	17	17.9	0	0.0	10	18.5	7	15.2	15	19.0	5	23.8	5	26.3	15	18.5
High school education	51	53.7	0	0.0	30	55.6	21	45.7	30	38.0	4	19.0	12	63.2	22	27.2
University education or more	20	21.1	1	20.0	8	14.8	13	28.3	8	10.1	5	23.8	1	5.3	12	14.8
χ^2(p)	**14.612^{*}($^{MC}p<0.001^{*}$)**				**2.777 (0.427)**				**4.391 ($^{MC}p=0.220$)**				**13.121^{*}($^{MC}p=0.003^{*}$)**			
Occupation																
Housewife/ I don't work	19	20.0	4	80.0	15	27.8	8	17.4	31	39.2	8	38.1	1	5.3	38	46.9
Administrative job	27	28.4	0	0.0	21	38.9	6	13.0	10	12.7	6	28.6	5	26.3	11	13.6
Vocational job	23	24.2	0	0.0	10	18.5	13	28.3	18	22.8	6	28.6	9	47.4	15	18.5
Free business	19	20.0	0	0.0	6	11.1	13	28.3	10	12.7	1	4.8	2	10.5	9	11.1
Craft job	7	7.4	1	20.0	2	3.7	6	13.0	10	12.7	0	0.0	2	10.5	8	9.9
χ^2(^{MC}p)	**8.788^{*} (0.008^{*})**				**14.784^{*} (0.005^{*})**				**5.999(0.179)**				**15.202^{*} (0.002^{*})**			
Family monthly income																
Enough	30	31.6	3	60.0	29	53.7	4	8.7	37	46.8	10	47.6	16	84.2	31	38.3
Not enough	48	50.5	2	40.0	12	22.2	38	82.6	33	41.8	5	23.8	3	15.8	35	43.2
Enough and save it	17	17.9	0	0.0	13	24.1	4	8.7	9	11.4	6	28.6	0	.0	15	18.5
χ^2(p)	1.625 ($^{MC}p=0.466$)				**36.820^{*}($<0.001^{*}$)**				**4.675 (0.097)**				**13.474^{*}(0.001^{*})**			

χ^2: **Chi square test** FE**: Fisher Exact** MC: **Monte Carlo** *: Statistically significant at $p \leq 0.05$

Table (11): Relation between health history and mean systole and diastole blood pressure

Health history	Tele-nursing (n = 100)		Traditional (n = 100)	
	Systolic	Diastolic	Systolic	Diastolic
	Mean ± SD.	Mean ± SD.	Mean ± SD.	Mean ± SD.
How long have you been suffering from high blood pressure? (years)				
<5	159.6±23.65	103.8±26.15	144.1±13.78	93.0±5.85
5 – <10	157.8±15.68	98.5±18.41	143.6±13.20	91.4±5.60
10 – <20	171.1±23.60	117.5±31.75	147.6±16.06	90.9±7.93
≥20	130.7±1.53	80.0±0.0	135.0±11.18	85.5±8.20
H(p)	**14.946*** **(0.002*)**	**14.563*** **(0.002*)**	**9.484*** **(0.024*)**	**9.511** **(0.023*)**
Does anyone in your family suffer from high blood pressure?				
Yes	161.1±18.18	102.8±23.22	142.7±14.64	90.8±5.95
No	164.0±24.91	110.1±30.50	145.7±14.36	91.4±8.16
U(p)	**1158.500 (0.715)**	**1122.00 (0.523)**	**1174.50 (0.597)**	**1168.50 (0.502)**
Do you take prescribed blood pressure			143.4±15.27	91.2±7.13
			145.7±12.98	90.9±7.12

medication regularly? Yes **No**	 161.4±23.26 163.2±19.04	 105.2±29.26 106.3±23.93		
U(p)	**1158.50 (0.522)**	**1057.50 (0.168)**	**1011.50 (0.410)**	**1091.50 (0.790)**
BMI Normal <18.5- <25 Overweight 25-<30 Obese ≥30	 166.5±47.38 160.7±24.15 162.6±20.10	 120.0±56.57 106.1±30.71 105.4±25.18	153.3±11.55 141.3±8.69 144.7±15.90	100.0±0.00 90.4±3.67 90.9±7.79
H(p)	**0.711 (0.701)**	**0.428 (0.807)**	**3.487 (0.175)**	**7.726* (0.021*)**
Do you currently smoke? **Yes** No I was smoking and stopped	 155.8±13.22 164.1±22.60 –	 97.0±16.08 108.2±28.41 –	146.0±12.81 144.0±15.44 140.0±0.00	91.0±7.68 91.2±7.21 90.0±0.00
Test of sig.(p)	**U=639.00 (0.063)**	**U=729.50 (0.266)**	**H=1.577 (0.454)**	**H=0.312 (0.856)**

U: Mann Whitney test H: H for **Kruskal Wallis test**
*: Statistically significant at $p \leq 0.05$

Discussion

Hypertension is an overwhelming global challenge. It is one of the major risk factors for global mortality. It is estimated to have caused 9.4 million deaths and 7% of disease burden as measured in DALYs in 2010. Its prevalence is increasing in a way that this number is predicted to rise to 23.6 million deaths by 2030. HTN is a public health challenge. However, it is often not taken seriously by patients due to its silence and chronicity. Appropriate lifestyle modifications are the cornerstone for the prevention and control of hypertension, which will result in the prevention of most complications and comorbidities associated with hypertension (Mohsen ,2013;Jain,2020;).

Tele-nursing is the use of technological resources and communication systems. It is becoming the new approach in encouraging the development of nursing and increasingly used in managing many chronic diseases especially after emergence of COVID-19 that obligated social distancing. Thus, the aim of this study was to evaluate the effect of implementing a tele-nursing versus traditional nursing program on knowledge, lifestyle modification and blood pressure control for hypertensive patients (Mohsen ,2013).

Regarding the socio-demographic characteristics, the current study revealed that both groups showed no significant difference in terms of age, sex, and marital status. Meanwhile, there significant difference regarding residence, occupation, and educational level. With respect to the health history, there were also statistically significant differences between tele-nursing and traditional groups regarding presence of comorbid diseases, length of having hypertension, symptoms associated with hypertension, smoking history, and BMI. This agrees with (Mohsen et al., 2019), who conducted a study in Menoufia and found that Participants of both groups were matched with regard to age, gender, AND BMI, while disagree regarding the level of education. This may be due to the homogeneity of the selected samples.

Concerning family history, it was evident that the highest percentage of the studied participants in both groups had family history of hypertension from their fathers in this study. This contradicts with (Ray, and JAMDADE, 2015), who studied hypertension among people in urban slums in Pune city, India, and reported that the highest percentages of the samples of both groups were not having family history of hypertension. This may be attributed to the difference in distribution of age groups between the two studies. The highest percentage of the studied participants lies in the age group of more than 60 years in the present study, while it was 4- -50 years in the other study. Also, cultural and environmental differences may be a reason.

As regard to compliance with prescribed medications. Results from the current study indicated that more than half of the participants in tele-nursing group were not complying with the prescribed medication. Meanwhile, the most of the participants in traditional group reported adherence with significance differences between both groups and the main reason was forgetting in both of them. This may be reasoned by the significant difference between both groups in residence and educational level. Also tele-nursing is a new trend. This was in disagreement with (Tao et al., 2013;Yang et al., 2019) who reported that tele-nursing has a significant effect on medication adherence in a short period of time among diabetic patients as evidence by ideal blood sugar control.

In addition, (Mohsen et al. 2020) indicated that telenursing was an effective strategy for improving arterial blood pressure, body mass index and decreasing the risk of its complications. Moreover, the same result was reported among MI patients (Najafi et al., 2016) and dialysis patients (Arad et al., 2021). Their rationale was as telenursing follow-up and consultation create an opportunity to provide need-based information and trainings for the patients that they can review at their convenience which support their adherence.

The current study showed that both the tele-nursing and traditional approach significantly improved the participants' knowledge about high blood pressure and a healthy lifestyle, with a statistically significant difference from pre to post program in both groups, with relatives and neighbors. This was in accordance with results obtained by (Najafi et al., 2016) for MI patients, (Zakerimoghadam et al. 2008) among type 2 diabetic patients. This can be attributed to the constant encouragement and advice given by the nurses to patients through a convenience strategy such as tele-nursing, which increase the patients' independence and self-care skills. Considering the limited time of health care providers, creating a network after discharge can support solving the patients' caring problems, and reduce the rate of hospital visits. Therefore, applying tele-nursing, which is time- and cost-effective, is highly recommended.

On the other hand, another study carried out by (Faraji, 2012), found that tele-nursing couldn't improve the patients' adherence to treatment and life style modification and emphasized the necessity of long term and regular follow-up for enhancing the patients' self-care behaviors in chronic conditions. This may be reasoned by the time, when this study was conducted (2012), during this time application of technology was limited and new. Meanwhile, nowadays telenursing and technology applications become more available and familiar to most people especially with COVID-19 epidemic.

Regarding commitment to blood pressure measurement, the current study showed that the total score of their adherence to the treatment of high blood pressure (total score of hill-bone scale) showed a statistically significant improvement post program than pre-program in both group. However, it was higher in tele-nursing group than traditional group. This was similar to the results from the study carried out by (Nurdin and Sakinah 2020), who indicated significance differences between intervention and control group using tele-nursing in self-management of hypertension. The same was found by (Pratama et al., 2015) in the management of diabetics ulcer treatment through the application of telenursing. Additionally, tele-nursing approach improved commitment to blood pressure monitoring and even reduction in blood pressure reading during the COVID-19 pandemic as reported by (Choi et al., 2021).

Regarding commitment to lifestyle modification to control blood pressure, results from the current study indicated that there were statistically significant differences between pre and post intervention in both groups, as well as between the two groups regarding all items and the total score of healthy lifestyle practices, with more commitment in tele-nursing group. This was in accordance with the results of (Gandomani et al. 2021) who showed that understanding a new type of training helped patients become more motivated, causing them to increase self-care and contact health providers more often which resulted in significant difference in mean (SD) SBP and DBP between experimental and control groups.

Furthermore, (Mohsen et al., 2020) reported that, there was no statistically significant difference in blood pressure levels average scores between the intervention (telenursing) and control (traditional) groups at baseline assessment in the pre-intervention stage. While there was a statistically significant difference in the systolic blood pressure level average scores between both groups after intervention.

The present study showed a statistically significant relation between educational level, occupation, monthly income, total knowledge and practice score in tele-nursing group. That's as, well educated people who had good monthly income empowered more to utilize technology and look for different sources of health information. Also, occupation and residence were significantly associated with total practice score in tele-nursing group. This may be as living in urban area and having occupation have influence on monthly income, which inturn improve their practice. These results are in the same line with (Ray and JAMDADE, 2015), who found association between age, gender and education, working status and past history of family history and knowledge score.

Moreover, there was significant relation between mean systole and diastole measurement and period of suffering from hypertension in tele-nursing group, while there was significant relation between diastole measurements only and BMI in traditional group in the present study. This contradicts with (Mohsen etal., 2020), who showed that there is a strong positive correlation among age, Body Mass Index, Systolic blood pressure and diastolic blood pressure of studied cardiac patients. Meanwhile agree in the point of BMI and diastolic blood pressure in traditional group only.

The current study reported evidence of the effectiveness of telenursing in enhancing patients' knowledge, adherence to medication and lifestyle change to control hypertension. It showed that there was significant positive correlation between the total knowledge score, total score of healthy lifestyle practices and total hill bone scale score (adherence to blood pressure measurement and medications) in both of the studied groups. These reported results were supported by findings of other studies conducted on different patients' population such as (Boroumand, & Moeini, 2016; Orozco et al., 2017 and Azulay et al., 2019).

Otherwise, (Bogale etal., 2020), reported that knowledge and attitude toward lifestyle modification recommended for hypertension management was fairly good among the participants but practice level was poor. They attributed this to that age range of 46– 64years, having formal education, being government employee and being housewives were factors significantly associated with good knowledge of LSM, whereas favorable attitude was the only factor significantly associated with good LSM practice.

Conclusion

Based on the findings of the present study, it can be concluded that, tele-nursing method was effective in enhancing patients' knowledge, adherence to antihypertensive medications and lifestyle modification for better control of blood pressure. Also, there was significant positive correlation between total score of healthy lifestyle practices and their total knowledge score for both groups.

Recommendations:

Based on findings of the current study, the following recommendations can be suggested:

-The health policymakers should consider tele-nursing in actively managing hypertensive patients in all health settings. It is considered a new intervention for those patients.

-Further studies with larger sample sizes, random assignment, longer follow-up periods and specific tele-nursing strategies are recommended to obtain more evidence on the positive effects of tele-nursing on the hypertensive patients' adherence to treatment.

References:

Abd Elgaphar S, Abd El Gafar S. (2017). Effect Of Tele-Nursing (Phone-Based Follow-Ups) On Self Efficacy, Healthy Lifestyle, And Glycemic Control in Diabetic Patients. IOSR Journal of Nursing and Health Science (IOSR-JNHS), 6 (3): 67-76. DOI: 10.9790/1959-

0603056776. Available at: www.iosrjournals.org.

Alsaigh S A, Alanazi M, Alkahtani M, Alsinani T, Abdullah A, Alghamdi T. (2018). Lifestyle Modifications for Hypertension Management. The Egyptian Journal of Hospital Medicine, 70 (12): 2152-2156. Retrieved from: Egypt_J_Hosp_Med_2018_70_12_2152_2156.pdf (who.int).

American Hospital Association. (2022). Fact sheet: Telehealth. Available at: Fact Sheet: Telehealth | AHA.

Arad, M., Goli, R., Pariad, N., Vahabzadeh, D. & Baghaei, R. (2021). Do the patient education program and nurse-led telephone follow-up improve treatment adherence in hemodialysis patients? A randomized controlled trial. Nephrology, 22, (119).

Azulay, R., Valinsky, L., Hershkowitz, F. & Magnezi, R. (2019). Repeated Automated Mobile Text Messaging Reminders for Follow-Up of Positive Fecal Occult Blood Tests: Randomized Controlled Trial. JMIR m Health and Health, 7, e11114. Retrieved from: Blood pressure and the new ACC/AHA hypertension guidelines - PubMed (nih.gov).

Bogale S, Mishore K, Tola A, Mekuria A, Ayele Y. 2020. Knowledge, attitude and practice of lifestyle modification recommended for hypertension management and the associated factors among adult hypertensive patients in Harar, Eastern Ethiopia. SAGE Open Medicine SAGE Open Medicine; 8: 1–9.

Boroumand, S. & Moeini, M. (2016). The effect of a text message and telephone follow-up program on cardiac self-efficacy of patients with coronary artery disease: A randomized controlled trial. Iranian journal of nursing and midwifery research, 21, 171.

Bosworth HB, Powers BJ, Olsen MK, McCant F, Grubber J, Smith V, et al. (2011). Home blood pressure management and improved blood pressure control: Results from a randomized controlled trial. Arch Intern Medicine, 171:1173–80.

Chimberengwa P, Naidoo M. (2019). Knowledge, attitudes and practices related to hypertension among residents of a disadvantaged rural community in southern Zimbabwe. PLoS ONE, 14(6): 1-16. Available at: https://doi.org/10.1371/journal.pone.0215500.

Choi, W.S., Kim, N.S., Kim, A. W., and Woo, H.S. (2021). Nurse-Coordinated Blood Pressure Telemonitoring for Urban Hypertensive Patients: A Systematic Review and Meta-Analysis. International Journal of Environmental Research and Public Health, 18(13) 6892.

Das B, Dash S. (2021). Assessing Knowledge Of Hypertension And Its Risk Factors among People Residing in Urban Area in Paschim Midnapore, West Bengal, India. International Journal of Scientific Research, 10 (6): 48- 49. DOI:10.36106/ijsr/0101732.

Dorans K, Mills K, Lui Y, He J. (2018). Trends in Prevalence and Control of Hypertension According to the 2017 American College of

Cardiology/American Heart Association (ACC/AHA) Guideline. Journal of the American Heart Association, 7 (11). Available at: https://doi.org/10.1161/JAHA.118.008888

Faezeh G and Mohammad E. (2019). Tele-Nursing in Chronic Disease Care: A Systematic Review, Jundishapur J Chronic Dis Care, 8(2): e84379.

Faraji M. (2012). The effect of sustained nursing consult by telephone (telenursing) on adherence to self-care and blood pressure in hypertensive patient referring to cardiovascular clinic affiliated shiraz university of medical science [Thesis] Shiraz (Iran): Shiraz University of Medical Sciences.

Flack J, Adekola B. (2020). Blood pressure and the new ACC/AHA hypertension guidelines. Trends Cardiovasc Med, 30 (3):160-164. Available at: Blood pressure and the new ACC/AHA hypertension guidelines - PubMed (nih.gov).

Garcia-Lizana, F., Sarria-Santamera, A. (2007). New technologies for chronic disease management and control: a systematic review. Journal of telemedicine and telecare, 13, 62-68.

Hasan D, Emeash A, Mustafa S, Abdelazim G, Alaa El-din A. (2014). Hypertension in Egypt: A Systematic Review. Current Hypertension Reviews, 10 (3):134 – 141.

Hill M, Bone L, Kim M, Levine D. (2000). Development and testing of the Hill-Bone Compliance to High Blood Pressure Therapy Scale. Prog Cardiovasc Nurs, 15(3):90-6. doi: 10.1111/j.1751-7117.2000.tb00211.x.

Jain S, JainV. (2020). Prevalence of hypertension and its associated risk factors among adults residing in urban slum: a population-based door-to-door study. Int J Community Med Public Health, 7(3):887-892. Available at: http://www.ijcmph.com pISSN 2394-6032 | eISSN 2394-6040.

Josip ^ulig , Marcel Leppée. (2014). From Morisky to Hill-Bone; Self-Reports Scales for Measuring Adherence to Medication. Coll. Antropol, 38 1: 55–62. https://www.longdom.org/proceedings/a-telehealth-nursing-intervention-for-type-2-diabetes-patients-42205.html

Kirkpatrick LA, Feeney BC., (2013), A simple guide to IBM SPSS statistics for version 20.0. Student ed. Belmont, Calif.: Wadsworth, Cengage Learning.

Kjeldsen S. (2018). Hypertension and cardiovascular risk: General aspects. Pharmacol Res, 129:95-99 .

Mills K , Stefanescu A, He J. (2020). The global epidemiology of hypertension. Nat Rev Nephrol, 16 (4):223-237. Doi: 10.1038/s41581-019-0244-2.

Mohsen I. (2013). Problem of hypertension in Egypt. Egyptian Heart Journal, 65(3):233–234. Science Direct. DOI:10.1016/j.ehj.2013.03.005

Mohsen M, Riad N, Badawy A , Abd El Gafar S , Abd El-Hammed B, Eltomy E. (2020). Tele-nursing versus Routine Outpatient Teaching for Improving Arterial Blood Pressure and Body Mass Index for Hypertensive Patients. American Journal of

Nursing Research, 8(1): 18-26. Available online at: http://pubs.sciepub.com/ajnr/8/1/3.

Najafi, SS., Shaabani, M., Momennassab, M., and Aghasadeghi, K. (2016). The Nurse-Led Telephone Follow-Up on Medication and Dietary Adherence among Patients after Myocardial Infarction: A Randomized Controlled Clinical Trial. Int J Community Based Nurs Midwifery, 4(3): 199–208.

Njambi O and Tanui A. (2015). Lifestyle modification in prevention of hypertension: Patient empowerment . Thesis autum 2014 SeAMK, Degree programme in Nursing: Social and heathcare Faculty.

OparilS, Acelajado M, Bakris G, Berlowitz D, Cífková R, Dominiczak A. (2018). Hypertension. Nat Rev Dis Primers, 4: 18014.

Organia E, Pangandaman H, Adap D, Lambayong G, Mukattil N, Macarambon R. (2019). A Systematic Review on The Effectiveness of Lifestyle Modifications in The Management of Hypertension. International Journal of Health Medicine and Current Research, 4 (04):1550-1564. At: http://www.ijhmcr.com.

Orozco-beltrand, D., Sánchez-Molla, M., Sanchez, J. J., Mira, J. J. & Group, V. R. (2017). Telemedicine in primary care for patients with chronic conditions: the ValCrònic Quasi-Experimental Study. Journal of medical Internet research, 19, e400.

Prevalence and hypertension cascade data are from the Egypt 2017 STEPwise approach to noncommunicable disease risk factor surveillance (STEPS) survey.https://extranet.who.int/ncdsmicrodata/

Sadeghi-Gandomani, H., Habibi, Z., Eghbali-Babadi, M., and Khosravi, A. (2021). Impact of Telenursing on Blood Pressure and Body Mass Index of People with Prehypertension: A Randomized Controlled Clinical Trial. Iranian Journal of Nurse Midwifery Research, 26)6), 544-549.

Tao, D., & Or, C. K. (2013). Effects of self-management health information technology on glycaemic control for patients with diabetes: A meta-analysis of randomized controlled trials. *Journal of Telemedicine and Telecare*, 19(3), 133– 143. Retrived from: https://doi.org/10.1177/1357633X13479701

Unger T, Borghi C, Charchar F, Khan N, Poulter N, Prabhakaran D. (2020). International Society of Hypertension Global Hypertension Practice Guidelines. Hypertension J, 75 (6): :1334–1357. Available at: 2020 International Society of Hypertension Global Hypertension Practice Guidelines.

WHO. (2021). Hypertension: key facts. Available at: https://www.who.int/news-room/fact-sheets/detail/hypertension.

WHO. (2020). WHO definition of hypertension. Available at: WHO Definition of Hypertension - Public Health.

WHO (2021). Guideline for the pharmacological treatment of hypertension in adults: Guideline for the pharmacological treatment of hypertension in adults. Geneva: WHO, Licence: CC BY-NC-SA 3.0 IGO. Available at: 9789240033986-eng.pdf (who.int).

Yang, S., Jiang, Q., and Li, H. (2019). The role of telenursing in the management of diabetes A systematic review and meta-analysis. Public Health nursing, 36:575–586.

Zakerimoghadam M, Bassampour SH, Rajab A. (2008). Effect of nurse-led telephone follow ups (Tele-nursing) on diet adherence among type 2 diabetic patients. Hayat, 14:63–71.