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Nursing Intervention Program to Improve Adherence of Elderly Patients with Chronic Diseases Toward their Medication

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ABSTRACT

Background: Medication adherence is becoming increasingly crucial for older people, due to its potential to impact healthcare utilization and treatment efficacy. **Aim:** was to improve medication adherence of elderly patients with chronic diseases. **Design:** A Quasi experimental design pre and post-test was utilized to achieve the study aim. **Setting** conducted at out-patient clinics at Beni-Suef university hospital**. Subjects:** A convenience sample composed of 106 elderly patients with chronic diseases. Tools: three tools were used; **(I)** Structured interviewing questionnaire, which includes, socio-demographic characteristics of the elderly patients, medical history, knowledge of elderly patients about chronic disease and medications, and factors affecting adherence of elderly patients toward their medications **(II)** Morisky medication adherence scale .**(III)** Drug attitude inventory scale. **Results:** There was a highly statistically significant improvement in the mean of total score of knowledge and attitude toward medication adherence pre and post program. There was a highly statistically significant difference of mean total score of morisky medication adherence scale pre and post program. **Conclusion:** The study concluded that, there was a highly statistically significant difference between items of medication adherence, knowledge and attitude of elderly patients with chronic diseases toward their medication with pre and post program. Finally there was a highly statistically significant positive correlation between total knowledge, total attitude and total medication adherence of studied elderly pre and post program **Recommendations:** Implementing health education programs that emphasize medication compliance and modern technologies for older patients, including Pill-Box, Automatic Pill Dispenser, and Draft a Calendar for better recall and follow-up.

Key words Medication Adherence, Elderly Patients, Improve, Chronic diseases, Nursing Program.

Introduction

Population aging is a human success story that reflects progress in economic, social, and medical development as well as public health and medicine and their roles in preventing injury, controlling disease, and reducing premature death (**United Nations [UN], 2020**).

Like other middle-income African nations, Egypt is experiencing a significant growth in the number of its population aged 65 and above, despite traditionally viewing it as a minor issue **(Angeli & Novelli, 2019).** Also, the number of elderly people in Egypt reached 6.9 million, representing 6.6% of the total population in Egypt (**Central Agency for Public Mobilization and Statistics,**

2022). Multimorbidity and polypharmacy were the most prevalent indicators:38% of people aged 60–74 and 76% of those aged ≥85 had multimorbidity, and 24.3% of people aged 60–74 and 59% of people aged ≥85 had polypharmacy **(Pazan&Wehling,2021).** Averagely, People 75 years of age and older use five or more drugs for more than half of their residual lives. Moreover, up to 74% of residents of long-term care facilities regularly use nine or more medications **(World Health Organization [WHO], 2019)**.

Adherence could be defined as the degree to which an individual's medicine-taking behavior, dietary habits, and lifestyle changes implementation relate to established recommendations from his healthcare provider **(WHO, 2003).** It can be explained as a combination of the term "compliance" which refers to taking the correct dose at the right time, while persistence involves continuing treatment throughout the prescribed period **(Lavielle, et al., 2018)**.

Non-adherence behaviors can be intentional or unintentional, which are usually distinguished by patients' medication-taking conduct, which is influenced by, firstly, processes such as pre-emptive thoughts or behavioral aspects, which eventually lead the patients to take their medication (e.g., to get better, habitual, or due to medication stock availability). Secondly, medication-taking conduct is distinguished by the outcome or action, i.e., patient ended up forgetting, skipping a dose, changing the amount, or delaying the time at which a medication should be taken **(*Fahrni,* et al.,2022).**

The World Health Organization Multidimensional Adherence Model (WHO-MAM) highlighted five dimensions that affect medication adherence: factors related to patients such as age, attitudes, beliefs and medication knowledge; socioeconomic factors as social support and costs; factors related to therapy as drug side effects and dose complexity; factors related to conditions as comorbidities; and factors related to the healthcare system as support from healthcare providers and unfavorable interactions with providers **(*Aldan,* et al.,2022).**

Nurses promote medication adherence in older adults through policy, systems, practice, and research, focusing on effective communication with caregivers and comprehensive interventions combining cognitive, behavioral, and affective components **(Cheng, et al.,2023).**

Significance of the study

The World Health Organization highlights that medication adherence directly influences patient outcomes, quality of life, health outcomes, and overall healthcare costs. Poor adherence is also estimated to cause 10% of all hospitalizations and underlie $100–300 billion of avoidable health-care costs annually owing to wasted medicine, unnecessary diagnostic procedures and excessive health-care provider utilization **(Baryakova, et al., 2023).**

Medication noncompliance can result in drug resistance and reactions, diminished quality of life, and higher rates of morbidity and mortality. It also contributes to higher exploitation of health services and increased medical expenses, adding a burden to both patients and the healthcare system **(Oates,et al.,2020).**

The WHO indicated that medication adherence rates for chronic diseases were 50% in developed countries and were expected to be lower in developing countries with less access to healthcare. Many studies showed that the general, predictable rates of medication non-adherence in Arab countries vary from 1.4% to 88%. Particularly among the elderly, the rates of non-adherence to pharmacological treatments are estimated to differ from 41 to 74% among older adults **(Abdallah, et al., 2021).**

So the current study aimed to evaluate the knowledge and attitudes of elderly patients with chronic diseases toward medication adherence and design nursing intervention programs to improve adherence, focusing on ensuring access to providers.

Aim of the Study

This study aimed to improve medication adherence of elderly patients with chronic diseases through:

1) Assessing knowledge, and attitudes of elderly patients with chronic diseases toward adherence of their medication.
2) Determining factors affecting the elderly patients with chronic diseases to adhere to their medications.
3) Designing nursing intervention program to improve adherence of medication for elderly patients with chronic diseases.
4) Evaluating the impact of nursing intervention program on elderly patients with chronic diseases toward adherence of their medication.

Research hypotheses

1) Elderly patients with chronic diseases have average level of knowledge and attitudes toward medication adherence.
2) There are multifactor caused elderly patients with chronic diseases not to adhere to their medication.
3) There is no relationship between age of elderly patients with chronic diseases and adherence to their medication.

Subjects and Methods

Research design

A quasi experimental study (one group pre / posttest) was used to achieve the aim of the current study

Setting

This study was conducted at out-patient clinics affiliated in Beni-Suef University Hospital/ Egypt.

Subjects:

A convenience sample composed of 106 elderly patients with chronic diseases, aged 60 years old and above, conscious, both gender males and females, attend for the first time and others who attend to follow up, all dependent and independent elderly patients with chronic diseases, able to comprehend and understand, and voluntarily agree to participate in the study.

Tools of data collection:

Tool I: Structured interviewing questionnaire was developed after reviewing the national and international related literature; it consists of the following parts:

Part 1: Personal and socio-demographic data of the sample: it includes: Socio-demographic characteristics of the elderly patients such as (age, gender, educational level, social status,...etc), medical history (type of chronic disease, onset of the disease, the number of medications per day,…etc).

Part 2: to assess knowledge of elderly patients with chronic diseases, toward adherence of their medication (Pre and posttest) includes:

- Elderly patients' knowledge about chronic diseases as regard (meaning of chronic disease, causes and characteristics, types and methods of preventing the chronic diseases).
- Elderly patients' knowledge about their medications for example (name of medication, shape and structure, rout, dose, side effects, contraindications, expiration date, time, indication of medication....etc**)**

The scoring system of the elderly patients' knowledge regarding chronic disease and their medications varies between zero, 1, 2, in respect to the following grades: complete answer scored (2), incomplete answer (1) and I don't know (zero).

Part 3: to determine and assess factors affecting adherence of elderly patients with chronic diseases toward their medications. It consists of 22 items, these factors are classified to factors related to patient, and factors related to therapy, disease related factors and healthcare related factors. The scoring system of factors affecting the medication adherence of elderly patients with chronic diseases, was classified as yes = 1, No = 2, don't know = 3

Tool II. Morisky Medication Adherence Scale (MMAS). (Pre and posttest).

The Morisky Medication Adherence was adapted from **(Al-Qazaz, et al, 2010)** to measure the medication adherence in elderly patients with chronic diseases. This scale consists of 13 items, five (5) of them are negatively worded items and the other items are positively worded items.

Scoring system: The rating scale was designed as three -point Likert scale with the response options 'Always' (2), ' Sometimes' (1) and 'Never' (zero) for positive questions and vice versa in negative questions. With a sum of scores, patients can be categorized as having high, Moderate or low adherence to medications, respectively. The elderly patients who scored high points on the MMAS were considered to have high adherence, while the other who scored low points were considered to have low adherence.

Tool III. Drug Attitude Inventory (DAI) Scale. (Pre and posttest): used to assess attitude of elderly patients toward their medication. It was adapted from **(Hogan,1983)** to assess the attitudes and perceptions of elderly patients with chronic diseases towards adherence to their medication. The DAI consists of 27 items, fifteen (15) of them are positively worded items and twelve (12) are negatively worded items.

Scoring system: The rating scale was designed as three -point Likert scale with the response options ' agree (2), ' nuteral' (1) and ' disagree'(zero) for positive questions and vice versa in negative questions**.** Patients who scored high points were considered to have positive response to medication, while the other patients who scored low points were considered to have negative response to medication.

Tools Validity and reliability

- **Content Validity:**

Tools were examined by a panel of five experts, three of them from the community health nursing staff and two experts from medical and surgical health nursing staff from faculty of nursing at Beni-Suef University to review the relevance of the tools for comprehensive, understanding and applicability.

- **Reliability:**

The reliability of the tools was done through consistency of the results over the time, the reliability of Knowledge questionnaire was Cronbach's Alpha (0.897)**,** the reliability of Drug Attitude Inventory Scale was Cronbach's Alpha (0.873) and the reliability of Morisky Medication Adherence Scale was Cronbach's Alpha (0.828).

Ethical considerations:

An official permission to conduct the study was obtained from the Scientific Research Ethical Committee of Faculty of Medicine Beni-Suef University. Prior to the study, the selected elderly were informed that the participation in the study is voluntary and informed about aim, methods, anticipated benefits, and about their rights to withdraw at any time, then a permission from them to conduct the study had taken.

Operational design

Preparatory phase:

It included reviewing past, current, national and international related literature and theoretical knowledge of various aspects of the study using books, articles, internet, periodicals and magazines to develop tools for the data collection.

Pilot study:

The pilot study has been conducted to test the clarity, simplicity of language used, applicability, and understanding ability of the tool. It has been conducted on **5%** of the total sample of (5) elderly patients from outpatient clinics at Beni-Suef University Hospital, fulfilling inclusion criteria. The results of the pilot study help refine the interview questionnaire and schedule the time framework. The participants of the pilot study were included in our study.

Field Work

- Official permissions were obtained from the manager of Beni-Suef University Hospital, then approval was obtained from the manager of outpatient clinics. Interview first with the manager and head nurse of outpatient clinics to introduce the importance and aims of research, then display the data show program for them.

- The researcher interviewed elderly patients in the outpatient clinics waiting room. The researcher first gathered the older patients to get to know them, gave them an explanation of the program's goals and estimated results, and gave them the assurance that the data would be kept private and utilized exclusively for scientific study. Then start to take informal consent from every patient who agrees to participate in the study. The researcher attended 3 days per week (Saturday, Monday, and Thursday) in outpatient clinics, from 9:00 am to 12:00 pm through a four months duration for four phases of nursing intervention program (pre and post). The patients were categorized into small groups; each group contained (5 – 10) patients. The nursing intervention program was applied during 4 sessions, each session lasted for about (25: 35) minutes, scheduled as 1 session per week for duration four weeks for each group.
- Data collection was carried out from April 2023 to August 2023 and consisted of four phases: the assessment phase, the plan phase, the implementation phase, and the evaluation phase.

Assessment phase

After obtaining the official permissions, the researcher assessed the involved elderly patients to know their level of knowledge about chronic illness and their medication, assessed the attitude of elderly patients toward adherence to their medications using a pre-test drug attitude inventory questionnaire, and assessed the level of adherence to medication among elderly patients with chronic illnesses by using the pretest morisky medication adherence scale (MMAS). The researcher was available at the outpatient clinics during the data collection sheet filling time to answer any question and provide the needed explanations.

Plan phase

After identifying the needs of elderly patients during the assessment phase, the investigator started to develop the program items (session's items, course outlines, and course content), design the program, and prepare the booklet as a method of teaching and education. **The general objective** of the program was to improve the adherence of elderly patients with chronic diseases to their medication. **Specific objectives** were to: identify the meaning of chronic diseases; mention types and essential causes of chronic diseases and how to prevent them; define adherence and non-adherence with medication; determine factors of non-adherence to medication; identify the consequences resulting from non-compliance with medications; illustrate how to take medications in a safe and useful way, discuss and explain ways to make it easier to remember when to take medications, explain mistakes and errors in taking medication, and determine how to improve the effect and efficacy of medication.

Implementation phase

The program was implemented by conducting sessions using different educational methods and media. The actual work started by meeting the selected sample in the outpatient clinics of Beni-Suef University Hospital. Firstly, the investigator introduces herself to them and gives them a brief idea of the study and its aim. Then the data was collected using a simple and clear Arabic questionnaire. Any clarification needed for the sample was given by the researcher. The program content has been sequenced through four sessions. At the beginning of the first session, an orientation about the nursing intervention program and its purposes took place. Each session began with a summary of what was given in the previous sessions and the objectives of the new session.

Evaluation phase:

After the implementation of the program, the investigator evaluates the level of enhancement in the elderly's knowledge, attitude, and adherence toward their medications by using a posttest questionnaire that is similar to the pretest. The posttest was done immediately after the end of the sessions of the intervention program using the same tools of pretest evaluation.

Statistical design

The collected data were organized, analyzed using appropriate statistical significance tests. The data were collected and coded using the Computer Statistical Package for Social Science (SPSS), version 25, and was also used to do the statistical analysis of data. Data were presented using descriptive statistics in the form of frequencies and percentages. Chi-square($\mathbf{X^2}$), and Pearson Correlation Coefficient tests were used to compare frequencies between study variables.

Degrees of significance of results were considered as follow:

- P value ≤ 0.05 significant (S)
- P value ≤0.001 highly significant (HS)

RESULTS

Table (1) reveals that; (73.6%) of the studied elderly aged from 60 -<75 years old, and the mean ± SD (71.24±10.23), (52.8%) were males and (57.5%) of them were widowed. Moreover, (40.6%) of them had not enough income, (67.0%) of them reside at rural areas and (81.1%) of them lived with their family.

Figure (1): reveals that; (67.0%, 57.5%) of the studied elderly had hypertension and diabetes as hypertension and diabetes are the most common types of chronic diseases among them.

Table (2): shows that; (26.4%) of the studied elderly had health insurance, (41.5%) had chronic diseases from 6 to 12 years ago and the Mean±SD (7.71±5.46). Furthermore, (70.7%) of them had taken four or more types of medication / day, and (54.7%) had follow up regularly at (Governmental hospital & Specialist health sector) to monitor their health condition.

Table (3): illustrates that; at the end of the program, there was an improvement in the knowledge of elderly about chronic disease and their medication that represented as:(70.8%,85.5%)had satisfactory knowledge respectively as compared to (23.6%, 38.7%) in pre- program. There was a highly statistically significant difference improvement in the mean of total score of knowledge post- program (27.15±5.07) as compared to (20.42±7.28) pre- program at p≤0.01.

Figure (2): reveals that; the total attitude of the studied elderly was improved from (25.5%) pre- program as compared with (67.9%) post-program, Mean±SD pre-program was (21.11±11.53) while, (38.35±8.91) post-program and there was a highly statistically significant difference between pre and post intervention at p≤0.01.

Table (4): illustrates that; after the end of the program the negative items of Morisky Medication Adherence Scale for example (forget to take medication, having medication only when symptoms get worse, stop taking medications without consulting the doctor, change the dose of medication without consulting a doctor, having medicines that are advertised on TV and radio, or medicines that are prescribed by relatives or friends without consulting the doctor) changed from negative response to positive response as compared to pre-program. Finally, there was an improvement in positive items of Morisky Medication Adherence Scale between pre and post program, and there was a highly statistically significant difference between all items of Morisky Medication Adherence Scale with pre and post program (p≤0.001**).

Figure (3): shows that; the studied elderly' medication adherence had improved at the end of the program (62.3%) had high level of adherence as compared to (29.3%) in pre- program. On the other hand, the level of low adherence among them was decreased from (39.6%) at pre-program to (0.0) at post-program and there was a highly statistically significant difference between pre and post program at p≤0.01, mean±SD(11.63±6.30, 19.68±4.84)pre and post program respectively.

Table (5): displays that; there was a highly statistically significant relation between total knowledge and gender, social status, income and work of studied elderly at p≤0.01**,** while not statistically significant relation with other items.

Table (6): reveals that; there was statistically significant relation ($p \leq 0.05$) between total scores of medication adherence and place of residence of studied elderly as P=0.047, and there was a highly statistically significant relation ($p \leq 0.01$) between total medication adherence and gender, age, social status, educational level and income of studied elderly

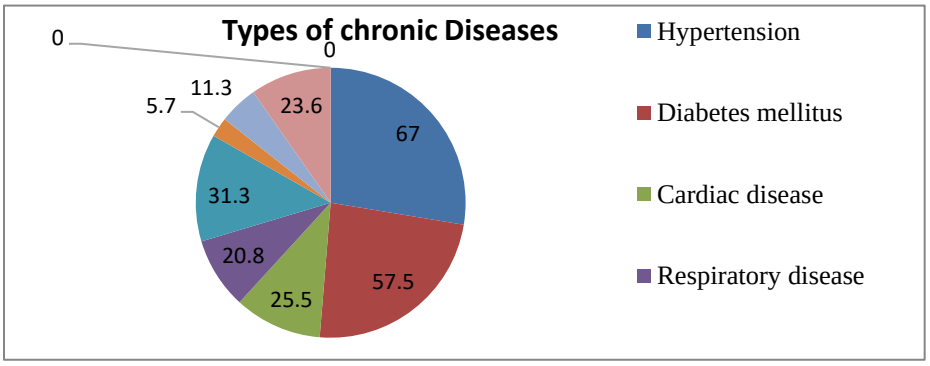
Table(7): demonstrates that; there was a highly statistically significant positive correlation between total knowledge and total scores of drug attitude inventory scale of studied elderly pre and post program, there was a highly statistically significant positive correlation between total knowledge and total scores of morisky medication adherence scale of studied elderly pre and post program, and there was a highly statistically significant positive strong correlation between total scores of morisky medication adherence scale and total scores of drug attitude inventory scale of the studied elderly pre and post program.

Table (1): Demographic Characteristics of the Studied elderly (n=106)

Items	No.	Percentage
Age		
60 -< 65 years	40	**37.7**
65 -< 70 years	23	**21.7**
70 -< 75 years	15	14.2
75 years and over	28	26.4
Mean±SD	**71.24±10.23**	
Gender		
Male	56	**52.8**
Female	50	47.2
Social status		
Married	41	38.7
Widowed	61	**57.5**
Divorced	4	3.8
Income		
Enough for basic needs	38	35.8
Intermediate	25	23.6
Not enough	43	**40.6**
Place of residence		
Rural	71	**67.0**
Urban	35	33.0
Live with		
Alone (independent)	15	14.2
With family	86	**81.1**
In nursing home	5	4.7
Work		
Don't work	80	75.5
Craftsman	9	8.5
Other	17	16.0

Table (2): Distribution of the medical history for studied elderly in outpatient clinics at Beni-Suef university hospital. (n = 106).

Items	No	Percentage
Treatment coverage		
Health insurance	28	**26.4**
Governmental expenses	15	14.2
Comprehensive insurance	5	4.7
Personal expenses	28	26.4
Family members	30	28.3
Onset of the disease		
1 year to <3 years	19	17.9
3 years to <6 years	25	23.6
6 years to <12 years	44	**41.5**
12 years and above	18	17.0
Mean±SD	**7.71±5.46**	
The number of medications		
Two types/ day	8	7.5
Three types/ day	23	21.7
Four or more types/ day	75	**70.7**
Do you follow up regularly to monitor your health condition?		
Yes, Governmental hospital	37	**34.9**
Yes, specialist health sector	21	**19.8**
No	42	39.6
Not interested	6	5.7
Follow-up period		
1 year to <3 years	20	18.9
3 years to <6 years	30	28.3
6 years to <12 years	8	7.5



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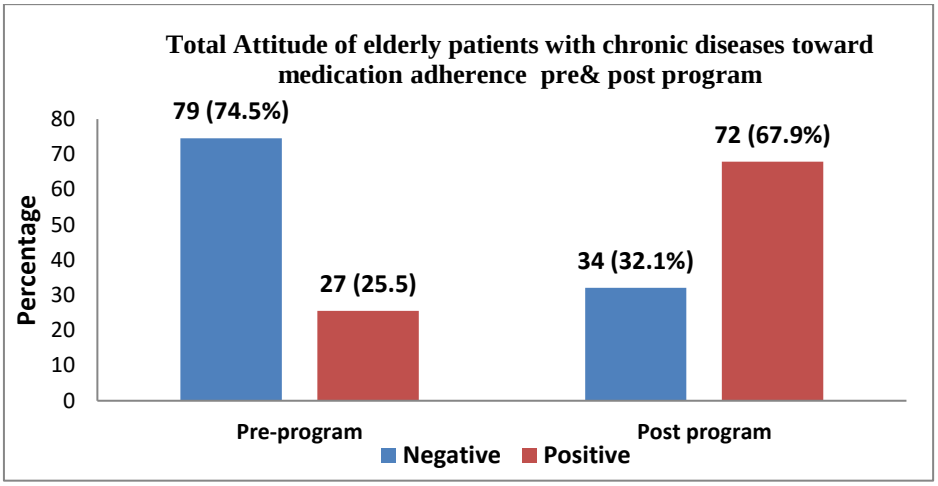
Numbers are not mutually exclusive.

Figure (1): Distribution of the chronic diseases of the studied elderly (n = 106).

Table (3): Distribution of the studied elderly according to their total knowledge about chronic disease and medication pre and post nursing intervention (n = 106)

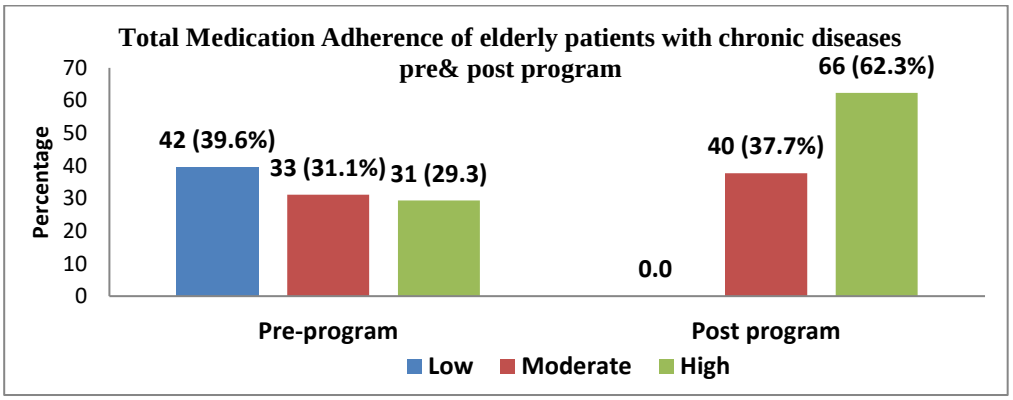
Knowledge about	Pre-program			Post program			X^2 p-value
	Mean±SD	Unsatisfactory	Satisfactory	Mean±SD	Unsatisfactory	Satisfactory	
Chronic disease	3.81±3.12	81 (76.4)	**25 (23.6)**	6.61±1.99	31 (29.2)	**75 (70.8)**	47.321 0.000**
Medication	16.60±4.55	65 (61.3)	**41 (38.7)**	20.54±3.57	15 (14.2)	**91 (85.8)**	50.189 0.000**
Total	20.42±7.28	74 (69.8)	32 (30.2)	27.15±5.07	27 (25.5)	79 (74.5)	41.772 0.000**

X^2 Chi square test ** Highly statistically significant at p≤0.01



(Chi square test (38.375), p-value (0.000**), Mean±SD (21.11±11.53, 38.35±8.91) pre and post program respectively.

Figure (2): Total scores of Drug Attitude Inventory scale of studied elderly with chronic diseases pre and post program. (n=106).



(Chi square test (47.376), p-value (0.000**) Mean±SD (11.63±6.30, 19.68±4.84) pre and post program respectively.

Figure (3): Total Scores of Morisky Medication Adherence Scale (MMAS) of studied elderly pre& post program (n = 106).

Table (4): Distribution of the studied elderly people medication adherence by applying Morisky Medication Adherence Scale (MMAS)of studied elderly pre& post program in outpatient clinics at Beni-Suef university hospital (n =106).

Items	Pre-program			Post program			X^2 (P-value)
	Always	Sometimes	Never	Always	Sometimes	Never	
Forget to take medication.	40 (37.7)	40 (37.7)	**26 (24.5)**	13 (12.3)	17 (16.0)	**76 (71.7)**	47.545 (0.000**)
When travelling or leaving home, you bring medications to take them on time.	34 (32.1)	31 (29.2)	41 (38.7)	70 (66.0)	19 (17.9)	17 (16.0)	25.273 (0.000**)
Having medication only when symptoms get worse.	51 (48.1)	20 (18.9)	**35 (33.0)**	12 (11.3)	11 (10.4)	**83 (78.3)**	46.281 (0.000**)
Took all medication yesterday.	56 (52.8)	2 (1.9)	48 (45.3)	79 (74.5)	13 (12.3)	14 (13.2)	30.630 (0.000**)
Use alarms and diaries to remember when to take medications.	18 (17.0)	33 (31.1)	55 (51.9)	63 (59.4)	26 (24.5)	17 (16.0)	45.886 (0.000**)
Link the date of taking the medicine to something fixed daily, so that do not forget the date of taking it.	16 (15.1)	40 (37.7)	50 (47.2)	67 (63.2)	27 (25.5)	12 (11.3)	57.150 (0.000**)
Stop taking medications without consulting the doctor.	35 (33.0)	32 (30.2)	**39 (36.8)**	8 (7.5)	28 (26.4)	**70 (66.0)**	26.037 (0.000**)
Change the dose of medication without consulting a doctor.	41 (38.7)	34 (32.1)	**31 (29.2)**	10 (9.4)	21 (19.8)	**75 (70.8)**	40.180 (0.000**)
Pay attention to food or beverages to be avoided during medication use	35 (33.0)	21 (19.8)	50 (47.2)	58 (54.7)	24 (22.6)	24 (22.6)	15.023 (0.001**)
Having medicines that are advertised on TV and radio, or medicines that are prescribed by relatives or friends without consulting the doctor.	38 (35.8)	32 (30.2)	**36 (34.0)**	11 (10.4)	17 (16.0)	**78 (73.6)**	34.943 (0.000**)
Read the medicine prescription before having medication.	25 (23.6)	23 (21.7)	58 (54.7)	52 (49.1)	19 (17.9)	35 (33.0)	15.537 (0.000**)
Pay attention to way of taking medication as on an empty stomach or full stomach.	44 (41.5)	21 (19.8)	41 (38.7)	65 (61.3)	25 (23.6)	16 (15.1)	15.359 (0.000**)
Keep medication in a place that maintains its validity.	45 (42.5)	24 (22.6)	37 (34.9)	74 (69.8)	19 (17.9)	13 (12.3)	19.169 (0.000**)

Table (5): Relation between socio demographic characteristics of the studied elderly and their total knowledge (n = 106).

Sociodemographic Characteristics	Knowledge				X^2 p-value
	Unsatisfactory		Satisfactory		
	No.	%	No.	%	
Gender					
Male	25	33.8	31	96.9	**35.683**
Female	49	66.2	1	3.1	**0.000****
Social status					
Married	19	25.7	22	68.8	**31.670 FE**
Widowed	55	74.3	6	18.8	**0.000****
Divorced	0	0.0	4	12.4	
Place of residence					
Rural	52	70.3	19	59.4	1.199
Urban	22	29.7	13	40.6	0.278
The income					
Sufficient for basic needs	19	25.7	19	59.4	
Intermediate	16	21.6	9	28.1	**16.378**
Not enough	39	52.7	4	12.5	**0.000****

Table (6): Relation between Socio-demographic Characteristics and total Scores of Morisky Medication Adherence Scale (MMAS) of studied elderly (n = 106).

Sociodemographic Characteristics	Morisky Medication Adherence Scale						X^2 p-value
	Low		Moderate		High		
	No.	%	No.	%	No.	%	
Gender							
Male	13	31.0	21	63.6	22	71.0	13.706
Female	29	69.0	12	36.4	9	29.0	**0.001****
Age							
60 - < 65 years	6	14.3	15	45.5	19	61.3	32.445 FE
65 - < 70 years	6	14.3	11	33.3	6	19.4	**0.000****
70 - < 75 years	9	21.4	2	6.1	4	12.9	
75 years and over	21	50.0	5	15.2	2	6.4	
Place of residence							
Rural	33	78.6	17	51.5	21	67.7	6.128
Urban	9	21.4	16	48.5	10	32.3	0.047*
Social status							
Married	9	21.4	14	42.4	18	58.1	15.284 FE
Widowed	33	78.6	17	51.5	11	35.5	**0.002****
Divorced	0	0.0	2	6.1	2	6.4	
Education level							
Illiterate	41	97.6	15	45.5	14	45.2	35.531 FE
Primary education	1	2.4	7	21.2	7	22.6	**0.000****
Secondary education	0	0.0	6	18.2	3	9.7	
Higher education	0	0.0	4	12.1	4	12.9	
Postgraduate studies	0	0.0	1	3.0	3	9.7	
The income							
Sufficient for basic needs	5	11.9	20	60.6	13	41.9	25.899
Intermediate	12	28.6	2	6.1	11	35.5	**0.000****
Not enough	25	59.5	11	33.3	7	22.6	

Table (7): Correlation between total Knowledge, Attitudes and Adherence among studied elderly Pre and post program (n = 106).

	Pre-program		Post-program	
	Knowledge r (P-value)	Drug Attitude Inventory Scale r (P-value)	Knowledge r (P-value)	Drug Attitude Inventory Scale r (P-value)
Drug Attitude Inventory Scale	0.700 (0.000**)		0.357 (0.000**)	
Morisky Medication Adherence Scale	0.548 (0.000**)	0.731** (0.000)	0.386 (0.000**)	0.755 (0.000**)

r Pearson Correlation Coefficient test

** Highly statistically significant at p≤0.01

Discussion

Non-adherence to medication is a prevalent and major public health problem. Up to 50% of patients with chronic illnesses do not take their medications as directed, according to a prior study. This suboptimal adherence has the potential to worsen existing medical disorders, reduce the quality of life, and increase mortality and morbidity rates. The severity of the issue is significantly worse among elderly people. Medication non-adherence is thought to be the cause of 10% of hospitalizations for the elderly and up to 75% of non-adherence in elderly people **(Alhabib,et al.,2022).**

concerning to age, the current study showed that less than three quarters of the elderly aged from 60<75 years old, and more than one quarter of them aged from 75 years and over and the mean ± SD (71.24±10.23). The findings align with the research conducted by ***Yilmaz, et al., (2020)*** on the "rational drug use of elderly individuals receiving home care service and the affecting factors." ,which revealed that more than two thirds of the studied elderly were between the ages of 60 and 75..Also ***Salama,et al.,(2017)*** who studied "medication knowledge as a determinant of medication adherence in geriatric patients, Serse Elian City, Menoufia Governorate, Egypt," agreed with this result and reported that more than half of the studied elderly aged from sixty to seventy-five years old and less than one third of them aged from seventy-five and over, and the mean ± SD (73.66±3.8).

As regard to gender, the current study revealed that the males were more than female, as more than half of the samples were males. This results agreed with **Shawkey,et al.,(2022)** whose study was an "assessment of older adults' knowledge and attitudes towards polypharmacy," found that males were more prevalent than females as they represented more than two-thirds of the studied sample. Men are more likely to experience chronic health illnesses earlier than women due to lifestyle, biological, and social factors like smoking, alcohol, stress, a lack of exercise, an unhealthy diet, and a lack of regular checkups.

The current study revealed that more than one-third of the elderly had enough income. This finding is inconsistent with **Awad,et al.,(2020)** who reported that more than half of the elderly had enough income. Older people often reduce working hours or stop due to retirement, health issues, or chronic diseases, leading to lower wages when they choose to continue working.

Concerning place of residence, the present study showed that more than two-thirds of the studied elderly reside in rural areas, and almost three-quarters of them weren't work. These results are consistent with **Xu et al., (2020)** who studied "factors influencing medication non-adherence among Chinese older adults with diabetes mellitus" and found that more than half of the sample were living in rural areas and almost all of them were unemployed.

The current study found that the majority of the studied elderly lived with their families. This result is in accordance with ***Abdallah,et***

al. (2021), who studied factors affecting medication adherence among elderly in rural areas, Sharkia governorate, Egypt, who supported this finding and stated that the majority of the studied elderly were living with their families, and ***Woodham, et al. (2018),*** who studied medication adherence and associated factors among elderly hypertension patients with uncontrolled blood pressure in rural areas, who agreed with the current finding and stated that approximately all of the studied elderly were living with their families

In terms of the medical history of the studied elderly, the current study presented that more than one quarter of the studied elderly had health insurance. This finding in accordance with the result of the study done by **Abdallah,et al., (2021)** who studied "factors affecting medication adherence among elderly in rural areas, Sharkia governorate, Egypt", found that three quarters of the studied elderly weren't insured.

On the other hand this result in contrary with ***Liu,et al., (2023)*** who studied "risk factors for self-reported medication adherence in community-dwelling older patients with multimorbidity and polypharmacy", who found that most of the studied patients had health insurance.

The present study found that more than two fifths of the studied elderly had chronic disease from six to twelve years ago and less than three quarters of them had taken four or more types of medication per day. In the light of these results ***Punnapurath,et al., (2021)*** who studied "medication compliance in geriatric patients with chronic illness", agreed with this results and found that less than half of the sample had the chronic diseases from 5-15 years ago and the majority of sample were taking more than seven medicines per day**.** These results may be explained by the higher prevalence of chronic illnesses in older persons, which raises the possibility of polypharmacy and polyprescriptions.

The study presented that more than half of the studied sample had follow up regularly at (Governmental hospital & Specialist health sector) to monitor their health condition**.** These findings incongruent with ***Ahmed, et al., (2023)*** who studied "medication adherence and its influencing factors in community-dwelling older adults with chronic illnesses in a rural area", who detected that more than half of the studied elderly hadn't follow up regularly with their doctors. The majority of elderly patients follow up with their doctors may be because they trust their medical advice, fear of deterioration of their health condition and they are afraid of death.

According to types of chronic diseases, the present study illustrated that; the most common chronic disease types among studied elderly people were hypertension and diabetes as (more than two thirds and more than half had hypertension and diabetes) respectively.

The result of the study in agreement with ***Abdalla,et al.,(2022)*** who reported that the majority of the studied elderly had hypertension and nearly three quarters of them had diabetes mellitus. Also, this result coincided with ***Shao and Dai., (2021)*** who studied "design of medicine box for the elderly with chronic diseases", who found that hypertension was the most common disease in his study followed by diabetes. On the other hand this findings conflicting with ***Bonilla-Sierra,et al.,(2020)*** who studied "chronic diseases and associated factors among older adults in Loja, Ecuador", who reported that the most prevalent chronic disease in the studied older adults was chronic obstructive pulmonary disease , followed by arterial hypertension and diabetes.

According to total scores of knowledge; the study illustrated that; after the end of the program, there was an improvement in the studied elderly' total knowledge about chronic disease and their medications for example the majority of the elderly patients had satisfactory knowledge about chronic diseases and their medications as compared to pre- program. There was a highly statistically significant difference improvement in the mean of total scores of knowledge between post- program and preprogram at $p \leq 0.01$.

This result parallel to ***IU,et al.,(2022)*** who support our result and found that the patient's total knowledge increased and improved after intervention as, fifty percent

of the patients had poor knowledge before the program but after the program they were very limited number ,while less than one quarter of them had good knowledge before the intervention but after the program, more than half of them had good knowledge, and there was a statistically significant difference improvement in the mean scores of knowledge between post- program and preprogram.

Our study discovered that; the total attitude of the studied elderly was improved as in preprogram one quarter of the elderly had positive attitude toward medication adherence as compared two third in post- program, there was a highly statistically significant difference as ($p \leq 0.01$) between pre and post intervention.

A study conducted by ***Aguglia,et al.,(2021)*** who studied "the role of attitudes toward medication and treatment adherence", supported the current result and demonstrated that there was an advancement of attitude toward treatment and medication compliance over the course of the study after educational intervention, which led to an improvement of disease symptoms.Furthermore ***Hulugappa & Ramegowda.,(2018)*** who studied "impact of health education on attitude regarding oral anti-diabetic drug adherence in type 2 diabetes mellitus" found that the positive attitude toward medication increased and there was a significant improvement in the post-test attitude score which is statistically highly significant($t=29.939$, $p<0.001$).

According to medication adherence among elderly people with chronic diseases: the current study illustrated that; after the end of the program ,there was an improvement in all positive items of morisky medication adherence scale as compared to preprogram as, more than two thirds of the sample were always done, and there was an improvement in negative items of morisky medication adherence scale for example (forget to take medication, having medication only when symptoms get worse, stop taking medications without consulting the doctor, change the dose of medication without consulting a doctor, having medicines that are advertised on TV and radio, or medicines that are prescribed by relatives or friends without consulting the doctor) as two thirds and more of the sample never done, while compared with preprogram.

Finally, there was an improvement in positive items of morisky medication adherence scale between pre and post program, and there was a highly statistically significant difference between all items of morisky medication adherence scale with pre and post program ($p \leq 0.001$**).

The findings of the current study in agreement with ***Yazdanpanah,et al.,(2019)*** who studied "effect of an educational program based on health belief model on medication adherence in elderly patients with hypertension", who illustrated that after the program there was an enhancement in all items whether positive or negative items of morisky medication adherence scale than preprogram, and there was a highly statistically significant difference between all items of morisky medication adherence scale with pre and post program($p \leq 0.001$**).

On the opposite side, the findings of the current study disagreed with ***(Samir, et al.,2020)*** who studied the "effect of a tailored health education program on medication management in the elderly" and discovered that the answers to the question given before and after the intervention "Do you ever forget to take your medicine?" and "Link the date of taking the medicine to something fixed daily, so that you do not forget the date of taking it.?" did not differ statistically significantly. But, there was a highly significant statistical improvement in the response to the question (increase positive responses): "When you feel better, do you sometimes stop taking your medicine?" and "Sometimes, if you feel worse when you take the medicine, do you stop taking it?" in the morisky medication adherence scale before and after intervention.

Regarding to total medication adherence among studied elderly, the present study showed that; the studied elderly' medication adherence had improved after the end of the program as nearly two thirds of them had high level of adherence as compared to less than one third in pre- program. On the other hand, the level of low adherence among them was decreased from nearly one third of

them at pre-program to zero at post-program, and there was a highly statistically significant difference in the studied elderly' medication adherence between pre and post program at p≤0.01.

The findings of the present study agreed with ***Poorcheraghi.,(2023)*** who studied the "effect of using drug management application on drug adherence and outcomes in older adults with polypharmacy," and illustrated that there was an enhancement in medication compliance of the studied elderly after the intervention, as half of them had a high level of adherence as compared to a minority of them in pre-intervention, and before the intervention, more than half of them had a low level of adherence, while after the implementation of the intervention, less than one quarter of them had a low level of adherence, indicating a significant difference. (p < 0.001).Likewise ***(Samir, et al.,2020)*** who agreed with the result and reported that there was a significant statistical difference in participants' medication adherence after the intervention program *(P value 0.004).*

Concerning relation between total knowledge and socio-demographic characteristics of studied elderly, the current study found that most number of male had satisfactory knowledge more than female and there was a highly statistically significant relation between total knowledge and gender as male had satisfactory knowledge about their medications more than female at p≤0.01.This finding congruent with ***Yilmaz,et al.,(2020)*** who reported that male had high level of knowledge about their chronic disease and their medications more than female and there was a highly statistically significant difference between total knowledge and gender of elderly individuals.

The current study represented that; the married elderly had satisfactory knowledge more than single and there was a highly statistically significant relation between social status and total knowledge.This finding disagreed with ***Bianciardi,et al.,(2021)*** who studied "knowledge, attitudes, and barriers to medication adherence in potential bariatric surgery patients", who declared that there was no association between patient's total knowledge and marital status.

There was a highly statistically significant relation between total knowledge, income, and work of the studied elderly. This finding disagreed with ***Wu,et al.,(2021)*** who studied "knowledge, attitude, and practice of medication among Haikou residents" and reported that there was no association between elderly total knowledge, monthly income, and their occupation.

Concerning to the relations between total scores of medication adherence and socioeconomic characteristics of the studied elderly, the recent study revealed that; patients in rural area more adhere to their medications (moderate and high) than in urban areas and there was statistically significant relation (p≤0.05) between total scores of medication adherence and place of residence of studied elderly as P=0.047.

This finding different from ***Fite.,(2021)*** who stated that where people lived had a substantial impact on their adherence to their medications as patients in urban areas in their studies were found to be more probable to adhere to their medication than in rural areas.

The recent study showed that; male more adhere to medication than female as number of male less than female according to low level of adherence and there was a highly statistically significant relation (p≤0.01**)** between total medication adherence and gender of the studied elderly.

This result is consistent with ***Alhabib,et al.,(2022)*** who studied "medication adherence among geriatric patients with chronic diseases in Riyadh, Saudi Arabia" and found that elderly males were more likely to adhere to their medications than elderly females.

The present study found that there was a highly statistically significant relation **(p≤0.01)** between total medication adherence and age of the studied elderly. This result agreed with **song,et al.,(2020)** who investigated "health literacy measurements used for assessing older adults' medication adherence" and found that adherence to medication significantly varied according to age, as 65–69-year-old adults have a higher

medication adherence rate than 70–79 and ≥80-year-old adults.

The current study found that; there was a highly statistically significant relation ($\chi 2$ = 15.284; p≤0.01) between total medication adherence scale and social status of elderly patients in this study .In accordance with this result ***Samir,et al.,(2020)***stated that there was a highly significant association(P value =0.000) between the medication adherence level and social status of the patients.

The recent study demonstrated that, there was a highly statistically significant relation (**p≤0.01)** between total medication adherence and educational level of elderly patients as illiterate elderly had low level of medication adherence than educated. There were many studies accepted with this result as, ***Jeyalakshmi,et al.,(2023)*** who studied "determinants of medication non-adherence among the elderly with co-existing hypertension and type 2 diabetes mellitus in rural areas" and ***Wang,et al.,(2023)*** who studied "association between medication literacy and medication adherence and the mediating effect of self-efficacy in older people with multimorbidity" who explored that; there was a statistically significant positive correlation between total adherence and educational level of elderly.

Regarding income, our study found that; there was a highly statistically significant relation between medication adherence and income of elderly people. This result consistent with ***Algarni,et al.,(2022), ji,et al.,(2020)*** and ***Samir,et al.,(2020)***all of them found that patients with lower incomes were shown to have lower adherence levels. Therefore, monthly income was discovered to have an impact on adherence levels.

Regarding correlation between knowledge, attitudes and adherence among studied elderly, the current study demonstrated that; there was a highly statistically significant positive correlation between total knowledge and total attitude toward medication adherence of studied elderly pre and post program.

This finding was reinforced by ***Nagai,et al.,(2020)*** who listed that there was positive correlation between patient knowledge and attitude and there was a significant difference in the drug attitude inventory scores between the subjects who gave correct answers regarding their chronic diseases and their medications, as patients who gave correct answers about their medications have positive attitude toward adherence to medications.

In the current study, there was a highly statistically significant positive correlation between total knowledge and total scores of morisky medication adherence scale of studied elderly pre and post program. The existing study finding parallel to ***Abdallah,et al.,(2021)*** who supported our result and showed that, there was a statistically significant positive correlation between medication adherence and medication knowledge , ***Issa,et al.,(2019)*** also agreed with this result and stated that there was a significant positive correlation between knowledge of individuals and their adherence level ,as the majority of patients expressed low levels of compliance to their medications and unsatisfactory knowledge about their medications.

The present study showed that there was a highly statistically significant positive strong correlation between total scores of medication adherence and total scores of attitude toward medication of the studied elderly pre and post program.

The results of this study are relevant to studies conducted by ***Madeline et al.,(2021)*** who showed that drug attitude is closely related to drug adherence, in the same line ***Purba,et al.,(2023)*** stated that negative attitudes towards medications are a major hindrance for patients to adhere to taking medicine according to a medical's prescription, as more than half of the sample had negative attitudes and performed low levels of drug adherence. Also the recent study result***s*** were supported ***by Dushad,et al.,(2019)*** who confirmed that there was a positive relationship between DAI & MMAS score. Negative drug attitude is known to increase risk of sickness and is a good indicator of poor compliance.

Conclusion

Based on the findings of the current study, it can be concluded that:

The present study results concluded that, after the end of the program, there was a highly statistically significant improvement in medication adherence, medication knowledge and attitude of elderly patients with chronic diseases toward their medication as compared to preprogram.

Additionally there was a highly statistically significant positive correlation between total knowledge and (total attitude and total medication adherence) of studied elderly pre and post program, and there was a highly statistically significant positive strong correlation between total medication adherence and total scores of attitude toward medication of the studied elderly pre and post program.

Also there was a highly statistically significant relation ($p \leq 0.01$) between total medication adherence and gender, age, social status, educational level and income of studied elderly, while not significant with other items.

Recommendation

Based on the current study's findings the following recommendations were proposed:

- Implementing health education programs that highlight the significance of medication compliance and the application of modern methods and technologies to assist senior citizens in recalling and following their prescription regimens, such as Pills-Box, Automatic Pill Dispenser, and Draft a Calendar.
- Activating the role of the community health nursing and community medicine to help the elderly adhere to taking multiple medications.
- Emphasizing the use of modern educational methods and communication methods in implementing health education programs such as booklets, advertisements and workshops for elderly patients to provide continuous educational programs about the huge consequences of medication non-adherence and to enhance knowledge, attitude and adherence toward their medications.
- Focusing on the utilization of positive aspects of society that impact the elderly, like enhancing living conditions, finances, education, and medicine awareness to support medication adherence.
- More research in this field is desperately needed, preferably with a large probability sample from a variety of geographic locations, to enable better representation and generalization of the findings.

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