Therapeutic Regimen Adherence among Elderly Diagnosed with Chronic Hepatitis C Virus and Virological Outcome

Sahar Ramadan Ebd El Ghani Hamzway, Prof. Dr.Eman Shokery Abd Allah *
Prof. Dr. Afaf Salah Abd El- Mohsen**, Dr. Aliaa Mohammed Othman El-Afandy***

*Dministrator of Geriatric Health nursing, *Professor of Community and Geriatric Health Nursing, **Professor of Community Health Nursing, *** Lecturer of Community Health Nursing, Faculty of nursing, Fayoum University, *Zagazic University **& *** Helwan University*

Corresponding Author: Sahar Ramadan Ebd El Ghani Hamzway

Abstract

Background: *Chronic hepatitis C virus infection is one of the major reasons of morbidity and mortality among elderly in the world.* **Aim**: *The current study aim to assess therapeutic regimen adherence among elderly diagnosed with chronic hepatitis c virus and virological outcome.* **Research design:** *Descriptive research design was used.* **Setting**: *The study was conduct at outpatient viral hepatitis unit at general hospital in EL-Fayoum Governorate.* **Sample**: *Purposive sample composed of 274 elderly diagnosed with chronic hepatitis c was used in this study undergoing direct acting antiviral treatment.* **Tool:** *Consist of five parts I: demographic characteristics, II: past and current medical history, III: virological outcome, IV: adherence to therapeutic regimen, V: factors affecting elderly adherence toward therapeutic regimen.* **Results:** *The result of the present study revealed that (%51.8, 34.3%and 13.9%) respectively had high, moderate and low adherence to medication. Total adherence to follow up, diet and exercise regimen was represent (65.7%,45.3%and 51.8%) respectively, (90 %) of elderly had virological response and had negative results after course treatment completion.* **Conclusion**: *The present study concluded that there was positive significant relation between adherences to therapeutic regimen and virological outcome and there was many factors had high affect level on adherence to therapeutic regimen such as age, educational level, knowledge, social, disease and therapy factor so this study* **Recommend to**: *Develop an education program to increase knowledge, advance adherence and maintain high sustain virological response and apply additional research in other setting for generalization.*

Keywords: *Elderly, Chronic hepatitis c virus, Therapeutic regimen, Adherence and Virological out come*

I. Introduction

Globally, population aged 60 or above is rising speedier than all younger age groups the number of elder individuals is expected to be more than double by 2050 and more than triple by 2100, population age growing from 962 million internationally in 2017 to 2.1 billion in 2050 (**United Nations.,2017**). Populaces are probable to aged rapidly in the Arab countries through the future few decades. Such as Egypt elderly accounted for 6.95 % of Egypt's population in 2014 (**Hussein and Ismail, 2017**).

Worldwide, an estimated 71 million people living with chronic hepatitis C and one of the chief generally reason of death and morbidity in the last period (**World Health Organization, 2017**). Hepatitis C means as blood born contamination transmitted through exposure to infected blood and can't be spread through unbroken skin or mucous membranes .There are six main hepatitis C genotypes with several subtypes being defined, chronic hepatitis C are consider the main causes of elderly group mortality and elderly has extreme prevalence of hepatitis C infection in 2013 (**Elgharably et al., 2017**).

The management of the elderly with chronic hepatitis C is evolving as a hot topic due to development of complication hepatitis C related liver disease gets faster with aging and even extra-hepatic manifestations of hepatitis C infection are possibly worse in the elderly so need early diagnosed that depended on the attendance of anti-hepatitis C virus . Antibodies as a screening process are noticed through enzyme immunoassay and quantitative hepatitis C virus and Ribonucleic Acid test are identified through a sensitive molecular method such as polymerase chain reaction (PCR) (**European Association for The Study of The Liver, 2017**).

Sustained virological response means as absence of viremia in 12 or 24 weeks after achievement of therapy. Once accomplished sustained virological response deliberate a true cure of the viral infection and associated with long-term health benefits that contain improved quality of life and liver histology and reduced occurrence

of liver cirrhosis, hepatocellular carcinoma and mortality consequence from complication of chronic hepatitis C virus **(Shah et al., 2018).**

Adherence is an essential point for successful hepatitis C treatment and virological outcome, adherence means as "the degree to which elders' behavior-taking medication, following a healthy diet, and/or performing lifestyle changes and agrees with accepted recommendations from a health-care provider **(Al-Ramahi, 2015**).

Significance of the study:

According to the National Academy of Sciences (2010), Egypt had the peak documented incidence of chronic hepatitis C in the world with an estimation of 14.7% are infected and 9.8 % are chronically ill. In addition, more than 500.000 new cases of HCV infections occur each year **(Fikry et al., 2015).**

In 2015, estimate 10% of the population are infected, existing indication proposes continuing hepatitis C virus transmission in Egypt, with higher prevalence rate relative to other countries .Chronic hepatitis C can be lead to the advancement of liver cirrhosis, elderly often require hospitalization. Supporting elderly can be a challenge to healthcare professionals especially geriatric nurses because elderly population may rapidly deteriorate and high risk for complications and death **(Kouyoumjian et al., 2018).**

Geriatric and community nurse had pivotal role in encouraging elderly on therapeutic regimen adherence, modifying elderly life style such as avoid smoking and alcohol intake and giving health education for elderly to determine set of intended actions that can be used to guidance behavioral change resulting in changes in knowledge, skills, and attitudes needed to maintain and improve health. **(Almadhoun, 2018).**

Aim of the study

The study aim to assessment of therapeutic regimen adherence among elderly diagnosed with chronic hepatitis C virus and virological outcome through the following objectives.

- Assessment hepatitis C virus elderly patient adherence to therapeutic regimen.
- Assess effect of adherence to therapeutic regimen on virological out com.
- Assess the factors affecting adherence to therapeutic regimen.

Research Question

 Is there relation between therapeutic regimen adherence and factor affecting therapeutic regimen?
- Is there relation between adherence to therapeutic regimen and virological outcome?

Subjects and Methods

Research design: Descriptive exploratory research design   was   used in the study.

-Setting: The study was conducted at outpatient viral hepatitis treatment unit, Fayoum General Hospital in El-Fayoum Governorate

Subject: purposive sample was used in this study to choose 274 elderly diagnosed with chronic hepatitis C that represented 10 % from 2740 case that constitute total number of elderly diagnosed with chronic hepatitis C virus from July 2016 to July 2017and had: inclusion criteria: elderly above 60 years with chronic hepatitis C virus for one year at least , conscious and exclusion criteria: such as elderly with mentally and psychiatric patient , affected with hepatitis (B)virus

 Tool for data collection: The data were collected by using the following tool

An interviewer questionnaire form: consists of five parts

Part I- Demographic characteristics: such as; age, gender, marital status, level of education, occupation.

Part II - past and current medical history, it composed of 9 closed ended questions such as onset of the disease and prescribed treatment regimen**.**

part III- Virological outcome which used before start course of treatment, during treatment and after treatment (after three month from end of medication dose), it composed 3 closed ended questions such as   quantitative of hepatitis C virus in blood before adherence to therapeutic regimen, if the elderly didn't know the result of PCR, investigators review or return to hospital filling system to get the result of PCR for all studied subjects , when result of PCR was less than 16 IU/L was considered negative result and between 200 000 -1000 000 IU/L was considered moderate result and more than 1000000 was considered high result .

. **Part IV**-Elderly adherence to therapeutic regimen which includes:

a-Morisky medication Adherence Scale that used to assess adherence to medication. This scale designed by (Morisky, 2014) and composed of 8 closed ended questions such as occasionally forgive to take medication, failure taking medication for other reason than disremembering, stopped taking medication without telling doctors, when travel forget to bring medication ,when symptoms under control stop taking medication and often difficulty remembering to take all medication **Scoring system:** questions were presented as 'yes/no' that scored 0/1 respectively, total scores of the Morisky medication adherence scale range from 0 to 8, scores < 6 were

considered low adherence, scores 6 – 7 were represented medium adherence, and scores equal 8 were represented high adherence.

b- Behavioral adherence questionnaire: Composed of 25 closed end questions were presented as 'yes/no' to assess the following;

i-Follow up adherence such as take follow up timetable , adhere to follow up , make essential investigation in proper time, follow up help in disease control, thing that follow up don't take time and cost and make virus C test to know types and amount of virus in blood.

ii- Exercise adherence such as adhere to regular exercise. Or side effect of medication had effect on daily of exercise

iii -Diet adherence such as increase salt intake, protein, carbohydrate, fluid and vitamin in food.

Scoring system: The answer was evaluated by using model key answer prepared by investigators, composed of 2 categories:scores was calculated by giving correct or satisfy response(one) and incorrect or unsatisfied response was given (zero).

Total score of adherence for categories of behavioral adherence (diet, exercise, and follow up)

<80 % considered not adherence

≥ 80 % considered adherence

Part V – Factors affecting elderly diagnosed with chronic hepatitis C: That composed of five main items and consists of 39 questions such as: **1-Elderly factor**: Consisted of (3) subdivisions factors (knowledge, motivation, smoking factor).

i- Knowledge factor: composed of (12) closed end questions such as Hepatitis C virus transmits by contaminated blood or spread by using edges of the barber/ear and nose piercing, Hepatitis C caused by virus, Exact diet required for the treatment of hepatitis C virus, New treatment of hepatitis C had more effect than interferon, knowing symptoms and complication of HCV, and there is vaccination of HCV. **Scoring system** were presented as correct answer/not correct answer and don't know 'The total scored of knowledge was 12 grads, (one) score was given for each correct answer from alternative and (zero) score was given to incorrect answer and don't know and then total classified into >75 % was considered good knowledge 50 %: 75% was considered fair knowledge and <50% was considered poor knowledge

Ii-Smoking factor: consist of 2 question such as smoking and smoking types and think that smoking affecting adherence to therapeutic regimen, Scoring system**:** total smoking factor score YES was given (zero) and NO was given (one).

iii Motivation factor: 3questions such as have an internal wish to treatment comprehensive, internal desire to life style change and interested with health increased desire to complete the treatment . Scoring system: Total motivation factor score YES was given (one) and NO was given (Zero).

2-Therapy factor: 5 questions such as treatment length period affected adherence to therapeutic regimen, find difficultly to treatment adhering due to medication side effects, difficult recognize helpful instruction or difficult to intake ploy pharmacy. scoring system: Total therapy factor score YES was given (zero) and NO was given (one).

3 -Disease factor: 2 questions were used such as distress from any chronic disease may be distressing adherence or symptoms such as (lack of concentration, attention or other affected adherence toward therapeutic regimen. Scoring system: total disease factor score YES was given (zero) and NO was given (one).

4-Social factor: 5 questions such as family help on therapeutic regimen adherence, go to doctor, take medication and adhere to therapeutic diet. Or there are someone from friends encourage exercising. Scoring system: total social factor score YES was give (one) and NO was given (zero).

5. Health care system factors: divided into health care place and health care team.

i. Health care place :(3) questions such as close to heath care place. Or did all the required medical services were available in place. Scoring system: total health care system factor score YES was given (one) and NO was given (zero).

ii. Health care team: (7) questions such as doctor answered all questions and give sufficient time, doctors and nurses concern with subjects problematic, medical team give health educations and nursing team explain any physician instruction. Scoring system: total health care team factor score YES was given (one) and NO was given (zero).**scoring system** for total factors score were calculated consisting of 39 items (subdivided according to median point (50%) into two categories.

Factor was ≥50 %consider high contributing factor.

Factor was <50% consider low contributing factor.

2-Operational design includes the following:

(a)-Pilot study: The pilot study was carried out on 10% of elderly under the study to test the applicability, simplicity and the competence of the tool.

(b)-Field work: The actual field work started from March 2018 till September 2018 for the data collection, sample of 274 of elderly with chronic hepatitis C attending the study sitting and investigators interviewed elderly before starting the first dose of medication in March 2018 after introducing themselves for studied subjects. The aim of the study and components of the tool were explained to the elderly at the beginning of data collection. Investigators went to outpatient viral hepatitis treatment unit 3day /week (Sunday, man day, Tuesday) at Moring shift from 10: a.m. until 2p.m for three month. Investigators interview about 5:7 elderly /day.-Time taken to filled study tools ranged from 30:45 minutes depending on the degree of understanding and response of elderly and after month from treatment interviewed with studied subjects to know result of PCR before start second dose of medication and after three month from the end of the treatment period reviewed hospital filling system result of PCR for all studied subjected.

(c)-Content validity: Revision of the tools were be done by proficiency of geriatric health nursing and community health nursing   to measure the content validity of the tool and the necessary adjustments were be done consequently**.**

Tools reliability: Tool was tested for its reliability by test –retest measurement .it was applied on 10% elderly with chronic hepatitis C selected   from Fayoum General Hospital Outpatient Viral Hepatitis Treatment Unit. The reliability was scaled as follows :< 0-0.25 weak reliability, 0-0.25-0-0.75 moderate reliability, 0.75-<1 strong reliability and 1optimum. The reliability for this questionnaire was 0,822.

3-Administrative design: Official permission from faculty of nursing, Helwan University was directed to Fayoum General Hospital, approvable to carry out this study.

Ethical considerations: Ethical authorization was be gained from the scientific ethical commission of Helwan University; in addition written informed consent was be attained from each participant prior to data collection they were be assured that anonymity and confidentiality were be guaranteed and the right to withdraw from the study at any time. Ethics, values, culture and beliefs were be respected.

Statistical analysis: was performed using SPSS (Statistical Package for Social Sciences) Version 16(SPSS Inc, Chicago). Variables were presented using number and per cent for qualitative variables, mean, and standard deviation for quantitative variables and scores

II. Results:

Table (1): Frequency Distribution of Demographic Data among Elderly Diagnosed with Chronic Hepatitis C (n=274).

Item	No	%
Sex:		
Male	115	42.0
Female	159	58.0
Age :		
60≤69	222	81.0
70<80	45	16.4
≥80	7	2.6
Mean±SD	66,4 ±1,8	
Residence:		
Rural	162	59.1
Urban	112	40.9
Marital status:		
Single	10	3.6
Married	125	45.6
Divorced	14	5.1
Widow	125	45.7
Educational level:		
Illiterate	141	51.5
Primary	79	28.8
Secondary	46	16.8
University	8	2.9
Current working status:		
Working	49	17.9
Not-working	225	82.1
Previous job:		
Farmer	65	23.7
Craft	17	6.2
No regular work	30	10.9
Professional	113	41.3
Housewife	49	17.9

Table (1): shows that elderly demographic data. As for age (81%)of them were 60≤ 69years old with mean age 66,7 ±1,8 and (58% and 59.1%) respectively of them were female and residence in rural area in addition (45.6%and 45.7%) respectively of them were married and widow, regarding education level (51.5%) of them were illiterate educational level and (82.1%) of them didn't have current work.

Table (2): Frequency Distribution of the Studied Sample Virological outcome, before during and after adherence to therapeutic regimen (n =274).

Virological outcome Item	No	%
The quantitative of hepatitis c virus in your blood before adherence to therapeutic regimen.		
Positive titter	**274**	**100**
• low titer 16-200 000 IU/L	7	2.6
• moderate 200 000 -1000 000 IU/L	69	25.2
• high titer above 1000 000 IU/L	198	72.2
The quantitative of hepatitis c virus in your blood during adherence to therapeutic regimen.		
Positive titter	**191**	**67.7**
• low titer 16-200 000 IU/L	104	38.0
• -moderate 200 000 -1000 000 IU/L	73	26.6
• -high titer above 1000 000 IU/L	14	5.1
Negative	**83**	**30.3**
The quantitative of hepatitis c virus in your blood after adherence to therapeutic regimen.		
Positive titter	**28**	**10**
• low titer 16-200 000 IU/L	17	6
• Moderate and high titer 200000-<1000000 IU/L	11	4.0
Negative	**246**	**90**

Table(2) **:** Represents quantitative amount HCV in blood before adherence to therapeutic regimen and reports that all studied subject had positive hepatitis C virus but 30.3% of them become negative during period of treatment while 90% of them become negative after treatment course completion .
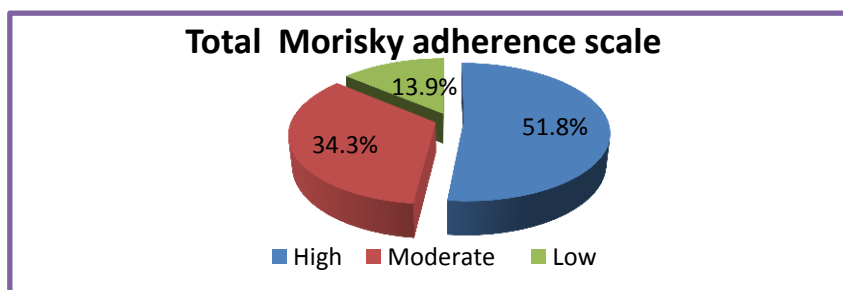

Figure (1): Total Adherence Morisky Scale among Study Elderly Diagnosed with Chronic Hepatitis C (N=274).

Figure (1): reveals that 51.8% of total study subjected had high adherence, (34.3%) of them had moderate adherence although (13.9%) had low adherence to medication regimen**.**
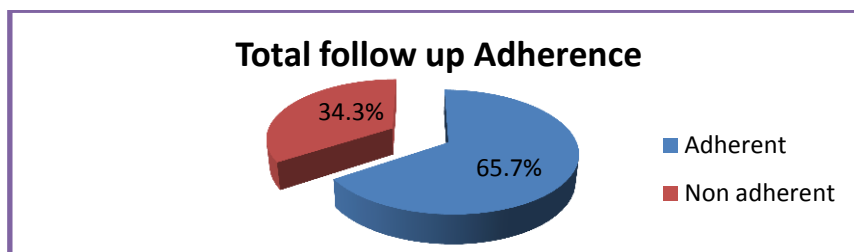
Figure (2): Total Follow up Adherence among Study Elderly Diagnosed with Chronic Hepatitis c (n=274).

Figure (2): Shows that 65.7% of total study subjected had total adherence to follow up comparing 34.3% of them had non adherence to follow up regime.
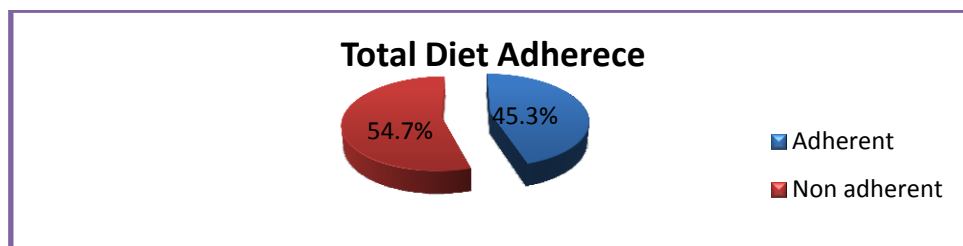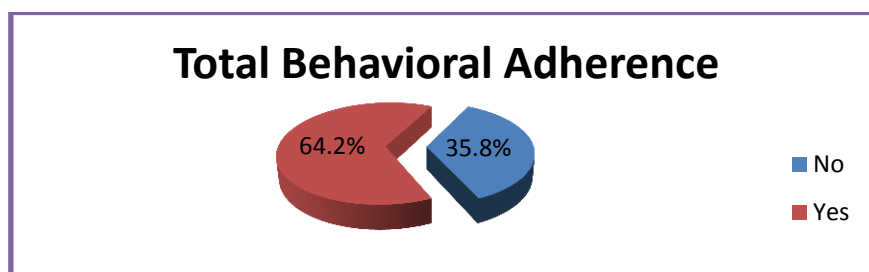
Figure (3): Total Diet Regimen Adherence among Study Elderly Diagnosed with Chronic Hepatitis c.

Figure (3): Shows that 45.3% of studied subjects had total adherence to diet regimen comparing 54.7% of them had non adherence to diet regimen.

Table (3): Frequency Distribution of the Studied Samples Exercise Adherence (n= 274).

Adherence to regular exercise?	No.	%
Yes	142	51.8
Possible result		
-Exercise makes feel better Physically:	138	97.1
-Exercise makes happy mode:	138	97.1
Exercise makes more alert:	138	97.1
Exercise improves my endurance in performing my daily activities:	129	90.8
prefer Walking than any types of sporting:	132	92.9
Mean ± SD		1.4±2.2
No	132	48.2
Possible causes - Joint pain (arthritis) affect daily exercise: - weak of vision affected daily exercise: - fear from fracture affected daily exercise: - Side effect of medication affected daily of exercise:	99 18 14 28	75 13.6 10.6 21,21

Table (3): concerning to studied subjects adherence to exercise regimen and reports that (51.8%) of studied subjects had total adherence to regular exercise comparing to (48.2%) of them did not have adherence to exercise regimen.

Figure (4): Total Behavioral Therapeutic Regimen Adherence (Follow up, Diet and Exercise) among Study Elderly Diagnosed with Chronis Hepatitis C.

Figure (4): shows that (64.2%) of total studied subject had adherence to behavioral therapeutic regimen comparing (35.8%) of them had non adherence to behavioral therapeutic regimen.

Table (4) Total Mean of Therapeutic Regimen Adherence items among Elderly diagnosed with chronic hepatitis C (n=274).

Variables	Mean (S±D)	Range
Total adherence scale		
• Morisky	1.05±1.55	0-8
• Follow up	7.1±2.2	0-9
• Diet	4.3±1.3	1-6
• Exercise	1.4±2.2	0-5

Table (4) shows (1.05±1.55, 7.1±2.2; 4.3±1.3 and 1.4±2.2) Mean of Morisky, Follow up, diet and exercise respectively.

Part III: Factor Affecting Elderly Adherence to Therapeutic Regimen: (n=274).
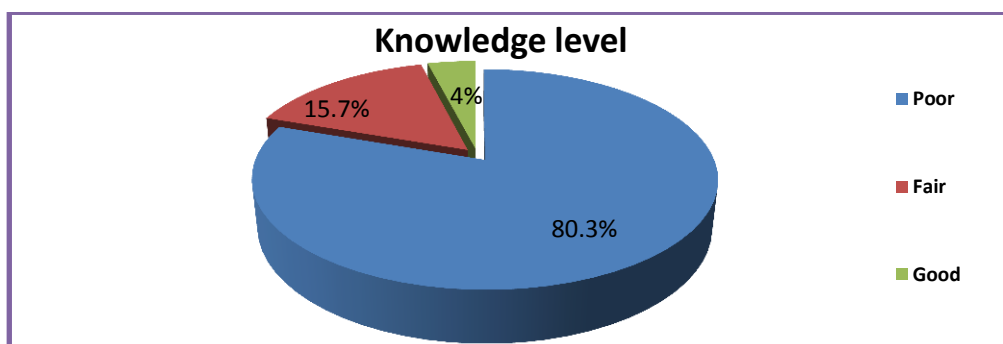

Figure (5): Total Knowledge level among Study Elderly Diagnosed with chronic hepatitis C:

Figure (5): Show that (80.3%) of total study subjected had poor knowledge and (15.7) % of them had fair   knowledge and (4%) of them had good knowledge.

Table (5) Total Mean factor that affect elderly adherence to therapeutic regimen (Mean ± SD) (n=274).

Item	Mean ± SD	Range
Knowledge	2.9±2.7	0-10
Motivation	2.8± 0.71	0-3
Therapy	3.7±1.3	0-5
Social	3.6±1.9	0-5
The health care team:	2.8±1.7	0-3
Place of health care	1.8±5.77	0-8

Table (5) : Illustrate total factor Means of contributing factor affect adherence with therapeutic regimen such as knowledge, motivation, therapy social and health care team   that represent (2.9±2.7, 2.8± 0.71, 3.7±1.3 and 3.6±1.9 and 2..8±1.7)respectively.

Table (6): Relation between Demographic characteristics of Elderly and Morisky Adherence scale.

Items	Level of adherence						Chi-square	P value
	high Adherent		Moderate adherence		low adherent			
	No.	%	No.	%	No.	%		
Sex :							1.5	0.47
Male	60	52.2	36	31.3	19	16.5		
Female	82	51.6	58	36.5	19	11.9		
Age:							13.2	0.01*
60<70	110	49.5	85	38.3	27	12.2		
70<80	28	62.2	6	13.3	11	24.4		
>80	4	57.1	3	42.9	0	0		
Residence :							1.53	0.463
Rural	89	54.9	52	32.1	21	13.0		
Urban	53	47.3	42	37.5	17	15.2		
Marital							11.7	0.069
Single	8	80.0	2	20.0	0	0		
Married	69	55.2	35	28.0	21	16.8		
Divorced	6	42.9	8	57.1	0	0		
Widow	59	47.2	49	39.2	17	13.6		
Education:							22.1	0.01*
Illiterate	60	42.6	52	36.9	29	20.6		
Primary	43	54.4	30	38.0	6	7.6		
Secondary	31	67.4	12	26.1	3	6.5		
University	8	100.0	0	0	0	0		
Current working status							0.203	0.903
Working	24	49.0	18	36.7	7	14.3		
Not-working	118	52.4	76	33.8	31	13.8		

Statistical significant p <0.05

Table (6) Indicates that there was some statistically significant relation between elderly demographic and Morisky adherence scale such as education level and age.

Table (7): Relation between Morisky Adherence Scale and Factor Affecting Adherence to Therapeutic Regimen.

Factors items	Level of adherence						Chi-square	P value
	High adherence		moderate adherence		low adherence			
	N	%	N	%	N	%		
Knowledge								
• Poor	113	51.4	69	31.4	38	17.3	12.6	0.013
• Fair	24	55.8	19	44.2	0	0		
• Good	5	45.5	6	54.5	0	0	12.6	
Smoke								
• Yes	56	50.5	43	38.7	12	10.8	2.4	0.302
• No	86	52.8	51	31.3	26	16.0		
Motivation								
• Yes	133	52.8	86	34.1	33	13.1	1.9	0.380
• No	9	40.9	8	36.4	5	22.7		
Disease								
• Yes	0	0	3	16.7	15	83.3	8.1	0.010*
• No	127	49.6	91	35.5	38	14.8		
Social								
• Yes	118	61.8	65	34.0	8	4.2	54.7	<0.001*
• No	24	28.9	29	34.9	30	36.1		
Therapy								
• Yes	11	6.3	59	33.7	105	60	48.9	<0.001*
• No	37	37.4	35	35.4	27	27.2		
Health system setting & provider								
• Yes	137	53.5	84	32.8	35	13.7	4.8	0.091
• No	5	27.8	10	55.6	3	16.7		
Total								
• Low	51	38.1	48	35.8	35	26.1	33.6	<0.001*
• High	91	65.0	46	32.9	3	2.1		

Statistical significant p <0.05

Table (7) shows significant relationship between Morisky adherences scale and some factor such as knowledge, social, therapy and disease factors and total factors

Table (8): Relation between Five contributing factor Affect Therapeutic Regimen and Behavioral Adherence (Diet, Exercise and Follow up) (n: 274)

Factors Items	Level of behavioral adherence				Chi-square	P value
	Adherence		Non Adherence			
	No.	%	No.	%		
Knowledge						
• Poor	131	59.5	89	40.5		
• Fair	35	81.4	8	18.6	11.02	0.004*
• Good	10	90.9	1	9.1		
Smoking						
• Yes	76	68.5	35	31.5	1.5	0.227
• No	100	61.3	63	38.7		

Motivation						
• Yes	164	65.1	88	34.9	0.977	0.323
• No	12	54.5	10	45.5		
Disease						
• Yes	12	66.7	6	33.3	0.050	0.824
• No	164	64.1	92	35.9		
Social						
• **Yes**	147	77	44	23	44.47	<0.001
• **No**	29	34.9	54	65.1		
Therapy						
• No	129	73.7	46	26.3	18.9	0.001
• Yes	47	52.5	52	47.5		
Health system						
• **Yes**	166	64.8	90	35.2	0.632	0.427
• **No**	10	55.6	8	44.4		
Total factor						
• **High**	62	46.3	72	53.7	36.6	<0.001
• **Low**	114	81.4	26	18.6		

Statistical significant p <0.05

Table (8): Shows significant relationship between behavioral adherence scales and some factors such as knowledge, motivation, social, therapy and total factors.

Table (9): Relationship between Virological Out come and Morisky Adherence Scale:

Morisky item	PCR				Chi-square	p-value
	Negative		Positive			
	No.	%	No.	%		
High	140	98.6	2	1.4	109.8	< 0.001
Moderate	90	95.7	4	4.3		
Low	16	42.1	22	57.9		
Total	246	89.8	28	10.2		

Statistical significant p <0.05

Table (9): shows that there is a significant relationship between adherence to therapeutic Morisky scale and virological outcome.

Table (10): Relationship between Virological Out come and behavioral adherence (diet, Exercise and Follow up Regimen

Behavioral adherence Item:	PCR response				Chi-square	P- value
	Negative		Positive			
	No.	%	No.	%		
Diet						
• yes	117	94.4	7	5.6	5.16	0.023
• **No**	129	86	21	14		
Fallow up					12.4	0.004
• **Yes**	170	94.4	10	5.6		
• **No**	76	80.95	18	19.14		
Exercise					5.1	0.027
• **Yes**	133	93.7	9	6.3		
• **No**	113	85.6	19	6.3		
Total adherence						
• **No**	81	82.7	17	17.3	10.4	0.002
• **Yes**	165	93.8	11	6.2		

Statistical significant p <0.05

Table (10): shows that there significant relationship between behavioral adherence item, and total behavioral adherence and virological outcome.

III. Discussion

Part I; Regarding the demographic characteristics of the elderly with chronic hepatitis C the present study finding revealed that the mean age of subject was 66, 4 ±1,8 years old, this study was in the same direction with **Alvarez et al. (2016)**, who conducted a published study in Canada ,Europe and Iran under the title "hepatitis C virus amongst elderly in long-term care: a systematic review of the literature and meta-analysis" and found that mean age of the elderly of participant study was 66, 7.

Concerning gender the present study finding revealed that more than half of studied subjects were females this findings agreement with **Omata et al. (2014),** who conducted a study in Japan under title of "Sofosbuvir plus ribavirin in Japanese patients" and reported that 54% of studied subjects were females.

Regarding marital status, less than half of studied subjects were married and widow, this finding disagreement with study was done by **Umumararungu et al. (2017),** entitled as "Incidence of Hepatitis C infection and its contributing Factors among Patients I Rwanda Military Hospital, " who reported that 63.9% of studied subjects were married and 2.2 % of them were widows .

Regarding sustain virological outcome (SVR12) most of studied subjects achieved sustain virological response after 12 week and this result Agreement with **Bischoff et al. (2018),** who conducted a published study in Germany entitled as "Proportions of sustained virological response 12 weeks subsequently the planned end of direct-acting antiviral based HCV : does HIV co infection prevent the response to combination therapy" and reported that 90.3%of studied subjects achieved virological response .

Adherence level was measured in the current study by using a validated 8-item Modified Morisky Medication Adherence Scale (MMMAS) and shows that more than half of studied subjects were high adherence to medication, nearly one third of them had moderate adherence although latest of them had low adherence to medication regimen and this finding agreement with **Yassine et al. (2016),** that conducted published study at outpatient clinics in Lebanese under title " Medication compliance in Lebanese hypertensive patients" and reported that 50.5% of study subjects were high adherence,.. According to the investigator point of view, consider elderly diagnosed with chronic hepatitis C as difficult group due to majority of elderly were illiterate and unknown hepatitis c disease in addition about third of them had pervious treatment with interferon, but currently depend on ribavirin treatment that causes anemia as side effect that interfered with adherence to treatment so, tenth of studied subjects didn't not achieve sustain virological response at 12 week due to discontinuous treatment.

Regarding follow up adherence, one third of studied subjects were non adherence to follow up, from the investigator point of view that may be due to more tenth of elderly think that follow- up didn't help on disease control, this finding in the same line with a published study was done by **Balkhy et al. (2017),** entitled as " Causes and Magnitude of follow-up at a tertiary care among patients with viral hepatitis " who conducted a study in Saudi Arabia and reported that 30 % of studied subjects were non adherence to follow up.

Regarding to adherence to exercise, more half of them had adherence to exercise especially walking and this finding was similar with thesis study **Shata (2014),** who conducted in Banha Qalyubia Governorate city under the title of " Assessment Need of Chronic Hepatitis C Virus Patient: Combination Therapy" and reported that half of studied subjects walked every day as exercise and were independent in daily activity.

More over **Mandoor (2013),** who conducted thesis study in Mansoura university hospital under title of **"** Kidney Transplantation Adherence patient to Therapeutic Regimen "and reported that about half of studied subjects were non adherence to diet and from the researchers point of view it may be due to lack of knowledge about diet regimen .

Regarding knowledge factor, the present study revealed that most of studied subjects had poor and fair knowledge about hepatitis C virus and this finding in the same line with a published study **by Fikry et la. (2015)**, entitled as "Preventive intervention Expected by Hepatitis C Patients in Alexandria-Egypt" who reported that majority of studied subjects had poor and faire knowledge about hepatitis C.

Also, The present study revealed that correct knowledge of the modes of transmission of hepatitis C virus among studied subjects were poor in most of the participants and this finding similar with published study was done by **Sultan et al. (2018),** who reported that most correct knowledge about the modes of transmission of hepatitis C virus among studied subjects were unsatisfactory ranging from 19.5 to 87.5%

Concerning therapy and health care system factor the current study showed that one third of studied subjects had difficulty in understanding the instruction of therapeutic regimen, and from the investigator point of view might be due to nearly half of studied subject illiterate and more than one third of participants complained from health care staff didn't have time to explain instruction ,this finding in the same line with **Ali (2015),** who reported that more third of studied subjects had difficulty in understanding the instruction of therapeutic regimen.

The current study showed that subjects who had high knowledge level had more adherences to medication and elderly who had poor knowledge level had low adherence to treatment this result agreement with a published study by **Jankowska (2016),** who conducted study in the Kosmonautów health center in Wroclaw under title of "Relationship between patients' information and medication compliance among patients with hypertension" and showed that there statistically significant relation between good adherences to treatment and high level of knowledge.

Regarding relationship between social factor and therapeutic regimen, the current study showed that social factor had high positive effect on adherence to therapeutic regimen this finding agreement with Phillips **& Barnes (2016),** who conducted a published study at Texas, entitled as " Adherence of Military Veterans With Hepatitis C and Social Care " and reported social support had high affect adherence to therapeutic regimen.

Regarding relationship between smoking factors, therapeutic regimen and virological outcome, the current study showed there positive significant relation between adherence to therapeutic regimen and virological out come and smoking factor not affect adherence and sustain virological response and this finding agreement with **Mason et al. (2017),** who reported a published study entitled as " Real-world compliance in the directly antiviral era: Assessment of adherence among people with a history of drug use at a community-based program in Canada and Toronto" that 89% of studied subjects reply to DAAs due to adherence to therapeutic regimen even studied subjects take substance abuse

Concerning relationship between adherence with medication and virological outcome the currents study showed that there was positive significant relation between adherence to medication and virological out come this finding agreement with **Ravi (2013),** who conducted study at hepatitis Clinic of Imam Khomeini Hospital in Iran under title of "Adherence toward Hepatitis C Treatment Regimen: First Report from a Referral Center " and mentioned there positive significant relation between adherence to ribavirin and achieve sustained virological response.

In current study there significant relation between adherence to follow up, diet, exercise and virological out come and this explanation support from **da Costa et al. (2018)**, who reported strong recommendation for treatment of nearly all hepatitis C virus infected patient with modifying individual behaviour in (The Pharmacist Guide to Implementing Pharmaceutical) .

IV. Conclusion

Based on the results of the present study and research question , there was positive significant relation between level of adherence to therapeutic regimen and social factor , high education level and virological out com ,while there was negative significant relation between adherence to therapeutic regimen and knowledge, medication ,therapy factor and disease factor

V. Recommendations

Based on the results of the present study and research question the following recommendations are suggested:

1- Periodic health education programs for elderly diagnosed with chronic hepatitis C and their family including nature of disease, therapeutic regimen, how to manage side effect of medication and how family provides social support for elderly with chronic hepatitis C.

2- Periodic health education programs for geriatric nurse about chronic hepatitis c and how to delay with elderly diagnosed with chronic hepatitis c

3- Apply further research in other setting for generalization.

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