Effectiveness of Nutritional Support on Clinical Outcomes of Patients with Hepatitis C Virus

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Abstract

Background: Hepatitis C virus is a major cause of acute and chronic liver disease worldwide. Therefore, it is vitally important that patients infected with hepatitis C virus (HCV) try to maintain a balanced diet with adequate daily caloric, protein, carbohydrate, fat, vitamins, minerals and fluids. Eating well can become more of a challenge as liver disease progresses. **Aim of the study** was to evaluate the effectiveness of nutritional support on clinical outcomes of patients with hepatitis C virus. **Research design:** A quasi-experimental research design was used. **Subjects**: A purposeful sample of 120 adult patients was selected according to inclusion criteria and randomly divided alternatively into two equal groups and assessed at three visits; 60 in each group: Study group (I) received nutritional support as prescribed by the treating physician. Control group (II) received an ordinary hospital diet. **Setting:** The study was conducted in the clinic of Liver Disease at Ain Shams university hospital. **Tools**: Two tools were utilized for data collection. First tool was Hepatitis C virus Patients nutritional assessment and the second tool was Hepatitis C Patient's Clinical outcome: **Results:** the result indicates decreasing in daily caloric intake which is significant in one-month post instructions (P=0.000) and three months post instructions (P=0.000) comparing with base line. There was a positive relation between incidence and severity of the complications and nutritional support of studied patients in relation to daily dietary intake than control group. **Conclusion:** There was improved score of Child Pugh Scale in the study group than control group at base line, one- and three-month post diet regimen. The nutritional support has a positive impact on incidence and severity of complications of studied patients. **Recommendations:** Diet for patients with hepatitis C should be prescribed individually based on total caloric requirement. Manual guidelines about allowed nutritional support of patients with hepatitis C should be available to every nurse caring for patients in liver disease unit.

Keywords: hepatitis C virus, nutritional support, caloric intake, nutritional management.

Introduction

The hepatitis C virus is a major public health problem and principal cause of chronic liver disease, cirrhosis, steatosis, carcinoma and liver transplantation. It is the main cause of very high morbidity and mortality and one of the top five leading causes of death in Egypt **(World Health Organization, 2013 and David et al., 2014).** Chronic hepatitis C regardless of the cause is characterized by several pathologic changes that are present to a variable extent in each case. These include the following: Hepatic necrosis, portal inflammation and periportal injury and inflammation, piecemeal necrosis, and fibrosis which may involve only the portal and periportal areas or may form septa **(Goodman and Ishak, 2017).**

Nutrition has been recognized as a prognostic and therapeutic determinant in patients with chronic liver disease. The effect on nutritional status depends on the duration of the disease and on the presence of any underlying chronic liver disease which may have already compromised the patients' nutritional status. Nutritional intervention by means of increased nutrient supply according to body requirements, or modified eating patterns can improve nutritional statuses such as nitrogen balance, serum protein concentrations, anthropometric measures, mortality, energy expenditure, and extra-hepatic tissue function.

Moreover, the diet is an important part of the overall management of HCV and may enhance the response to treatment and its side effects ***(Madill and Fortier, 2015).*** Similarly, increased body weight, and particularly, high BMI, is associated with accelerated fibrosis progression in the setting of chronic hepatitis C ***(Powell et al., 2016).*** Also increased body weight has a negative impact on the probability of sustained virologic response to

dual therapy with Peg-IFN and RBV ***(Manns et al., 2018).***

Moreover, they will enable nurse to play a significant role, in providing holistic care for these patients. This care will be individualized taking into consideration all aspects of patients' life physical, psychological and social, in order to enhance their health life **(Olson et al., 2011)**.

Significance of the study:

Egypt has the highest prevalence of hepatitis C in the world. The national prevalence rate of HCV antibody positivity has been estimated to be between 10-13% of the total population due to past practice of parenteral therapy for schistosomiasis in the second half of the last century which is responsible for the high prevalence of morbidity and continued endemic transmission of HCV today **(Mohamoud, 2013).** According to the statistical record of the Outpatient clinic of Liver Disease of the Ain Shams University Hospital, the total number of viral hepatitis C patients up till December 2018 was (17000) patients.

Good nutritional support and advice for patients with viral hepatitis C virus can achieve significant improvements in the nutritional status and reductions in morbidity and mortality. It decreases the body weight of obese patients by adjusting total caloric requirements. Also prevents or treats malnutrition or deficiencies in specific nutrients and potentially hinders the progression of the disease. Moreover, it decreases the rate and incidence of complications of the disease ***(Bernadine, 2018).***

Aim of the study:

The aim of the current study was to evaluate the effectiveness of nutritional support on clinical outcomes of patients with the hepatitis C virus.

Research hypothesis:

Nutritional support has a positive effect on the incidence and severity of complications in studied patients.

Operational definition:

Nutritional support means:

- Total caloric requirement is calculated for each patient according to their body requirement.

Clinical outcomes mean:

- Reduction of expected complications for patients suffering from viral hepatitis C virus.
- Absence of signs and symptoms of malnutrition.
- Stability of the liver function test.

Materials and method

Research design

A quasi-experimental research design was utilized in the current study. A quasi - experimental design is defined as an empirical interventional study used to estimate the causal impact of an intervention on its target population without random assignment **(Handley et al., 2018).**

Setting:

The study was conducted in the outpatient clinic of liver disease of ain shams university hospital, affiliated to Ain Shams University: Egypt. The liver outpatient clinic on the first floor; consisted of three rooms with one bed for each.

Subjects:

A purposeful sample of 120 adult patients of both sexes with inclusion criteria with the diagnosis of hepatitis C virus within three months. The calculation of sample size is based on power analysis. As about 1700 patients in the year, 2018 visited the previously mentioned setting. **The sample size was calculated based on:**

$$\mathbf{N=}\ \frac{N\times p\,(1-p)}{\{N-1\times (d^2\div z^2)\} + p\,(1-P)\}}$$

-Type I error with significant level (α) = 0.05.

-Type II error by power test (1-B) = 95%.

The minimum sample were 120 cases ***(Suresh & Chandrashekara, 2012).***

- **Group I (study group):** consisted of 60 adult patients receiving their nutritional support as calculated by the researcher and described by the treating physician
- **Group II (control group):** consisted of 60 adult patients receiving their nutritional support as patient routine diet.

Inclusion criteria:

- Compensated degree of liver cirrhosis.
- Free from liver complications (ascites and varices).
- Free from any associated chronic disease such as cardiac, renal and diabetes mellitus.
- Compliance with pharmacological treatment

Tools of data collection:

Two tools were used to collect the necessary data about the study subjects as the following:

Tool (1): Hepatitis C virus Patients nutritional assessment: This tool was developed by researcher based on recent relevant literature review to assess the nutritional status and it was comprised of the following:

Part I: Bio socio demographic and medical data: It was used for collection of personal and medical data that includes: socio demographic characteristics such as: age, sex, level of education, occupation, and marital status. Medical data such as: date of admission, diagnosis, duration of disease, previous hospitalization, and past and present medical history.

Part II: Anthropometric measurements:

- **Height and weight:** were taken **(World Health Organization, 2010). Body Mass Index (BMI):** It was calculated by dividing the weight in kilograms by the square of the height in meters (kg/m2). Standards classify BMI into several categories; below 18.5 /underweight, 18.5-24.9/ normal, 25-29.9/overweight, 30-39.9/obese, and above 40/ very obese. Findings were compared against normal values **(Johnstone, 2016). Mid Arm Circumference (MAC) and Triceps Skin Fold Thickness (TSF):** were used to assess the skeletal muscle mass and fat storage. Both are measured at the same site, with the patient's right arm in a relaxed position. The normal mid arm circumference for female is 21-23 cm and male is 23.0-25.5, while the normal TSF, is for male 7.5-12.5 mm is and for female is10-16.5 mm. Three measurements were taken for both TST and MAC, with average values calculated and recorded **(John, 2015).**
- **Mid-Arm Muscle Circumference (MAMC):** It was used to measure muscle protein mass that calculated from mid arm circumference (MAC) and triceps skin fold thickness (TSF) using a standard formula: MAMC (cm) = MAC (cm) - [0.314 × TSFT (mm)]. Adults MAMC ranged from 18.5-25.5 (cm). Measures below 15 (cm) indicate protein depletion. Findings were compared against normal values **(Al-hamdan, 2014).**
- **Abdominal circumference:** Normal values are 89.54 ± 7.53. Findings were compared against normal values **(Al-Metyazidy, 2017).**

Part III: the nutritional formula: this part was used for calculation of daily caloric requirements by using the Harris-Benedict Formula using the variables of height, weight, age, and gender to calculate the Basal Metabolic Rate (BMR) **(Campbell et al., 2015).**

Harris Benedict Formula for Women:

BMR= 655+ (9.6 x weight in kilos) + (1.7 x height in cm) -(4.7 x age in years).

Harris Benedict Formula for Men

BMR = 66 (13.7 x weight in kilos) + (5 x height in cm) -(6.8 x age in years).

After that, the result of the equation for both man and women was mixed with activity level and danger level of the disease. The activity level was estimated as sedentary, light, moderate, very active, and extremely active. The danger level was estimated as1.45 for viral hepatitis patients **(Houtkooper, 2014).**

Tool II: Hepatitis C Patient's Clinical outcome:

Part I: Daily dietary intake calculation: It was used to assess daily dietary intake. It includes all types and amounts of food and fluid ingested by the control and study group using household measurements. Then dietary analysis of ingested food was calculated according to food a dietary composition tables or tables of food nutritional values **(Al Metyazidy and Jack, 2017).**

Part II: The Child-Pugh score: (Thomson and Seeff, 2015): This part was developed by Pugh in 1972. It was used to assess the prognosis and severity of liver disease, predict mortality through signs and symptoms of disease and result of liver function tests. The score was ranged from 1-3where one indicates stage I and 3 indicate stage III. The child Pugh is categorizing liver cirrhosis patients into three classes Class A＝5-6 point indicates stage I, Class B＝7-9 point indicates stage II and Class C=10-15point indicate stage III

The score was ranged from 1-3 where one indicates stage I and 3 indicate stage III as the following:

Measure	1 point	2 points	3 points
Total bilirubin, µmol/l (mg/dl)	<34 (<2)	34-50 (2-3)	>50 (>3)
Serum albumin g/dl	>35> 3.5)	2.8-3.5	< 2.8
INR	<1.70	1.71-2.20	> 2.20
Ascites	None	Mild	Severe
Hepatic encephalopathy	None	Grade I-II (or suppressed with medication)	Grade III-IV (or refractory)

The child Pugh is categorizing liver cirrhosis patients into three classes from A to C.

Class A=5-6 point indicates stage I

Class B=7-9 point indicates stage II

Class C=10-15 point indicates stage III

Method

- A permission to carry out the study was obtained from the responsible authorities of Ain shams university hospital.
- Ethical considerations and informed written consent were taken from participants before the study, after an explanation of the purpose of the study. Confidentiality and privacy were maintained. The researcher emphasized that participate in the study was entirely voluntary and anonymous, each patient was informed that refusal to participation in the study would not affect their care. At any time during the study the patient has the right to withdraw from the study.
- All tools were tested for content validity by 10 experts (jury) in the field of the study including nursing specialist from faculty of nursing ain shams university and medical specialists in the outpatient Liver Disease Unit in the Ain shams university hospital.
- All tools were tested for reliability using test retest method on 10% of the subjects (10 patients) suffering from for hepatitis C virus for testing the reality of the tools.
- A pilot study was conducted on 10% of the subjects (10 patients) for testing the feasibility and applicability of the tools. The needed correction, modifications, omission and addition were made. Patients included in the pilot study were excluded from the study subject.
- Patients who follow the inclusion criteria were recruited randomly and divided alternatively into two equal group, each of 60 patients:
  - **Group I (study group):** they were receiving and compliance with their nutritional support as calculated by researcher and confirmed by treating physician.
  - **Group II (control group):** they were receiving their nutritional support as patient routine diet.

  Data collection was started, and continued for a period of 12 months from the beginning of January to the end of December 2018. Every patient was interviewed individually in the waiting room by the researcher using tools I, and tool II to collect the necessary data related to patient's socio-demographic data, Anthropometric measurements, the nutritional formula, Daily dietary intake calculation and The Child-Pugh score. Each interview lasted about 30-

45 minutes. The framework of the study was carried out according to **four phases:**

1-Assessment phase:

- Patients who agreed to participate in the study and fulfilled the inclusion criteria were included in the study. They have divided alternatively into two equal groups:

Group I (study group): they consisted of 60 adult patients receiving their nutritional support as calculated by the researcher and confirmed by the treating physician.

Group II (control group): they consisted of 60 adult patients receiving their nutritional support a home diet.

- All patients of both groups were assessed immediately on the first visit to the outpatient clinic of the liver disease unit of Ain shams university hospital to collect baseline data using the two tools I, and II.

Planning phase:

- Based on the finding of the assessment phase and literature review for group 1 goals, priorities, and expected outcomes were formulated.
- In this phase three sessions were planned by the researcher for the study group to provide the patients with general guidelines about nutritional support and its effect on their clinical outcomes.

Expected outcomes:

a. Return to his ideal body weight.
b. Changes the dietary habits according to daily caloric requirement.
c. Stability of the liver function test within the normal range.
d. Free from signs and symptoms of malnutrition or over nutrition.
e. Free from signs and symptoms of complications.
f. Return to normal anthropometric measurements such as body mass index, mid arm circumference, mid arm muscle circumference, and triceps skin fold thickness.

- Colored booklet was developed to be distributed to each patient of group I **(study group)** or family members.

Implementation phase: Group I (study group):

- In this phase the nutritional support was prescribed by the researcher as confirmed by the treating physician using Harris Benedict Formula **(Campbell et al., 2015).**
- The nutritional support was formed and presented in form of a diet that contains the total calories required throughout the day as follows: calories 40%, carbohydrate 55 %, protein1.5gm/kg/d, and fat 35%. 1gm of carbohydrates provides 4 Calories (kcal), 1gm protein provides 4 kcal, and 1gm protein provides 9 kcal **(Al Metyazidy, 2017).**
- The instruction about the diet was presented to each patient in the outpatient clinic.
- The instruction about the diet was illustrated to each patient in form of sessions in the first week and post first visit the clink using an idea, poster, and the colored booklet:

  The first session: Covered the component, function of the liver, symptoms that there is a problem with liver.

  The second session: definition, causes, signs and symptoms, different stages of HCV, how to protect our self-form hepatitis, diagnostic measurements and follow up.

  The third session: It covered the goal of the nutritional support, factors affecting regimen diet and what to be considered when preparing the diet and allowed daily caloric requirement as illustrated in the colored booklet, and prohibited food.

- Patients were advised to follow the instructions and/or attend to an outpatient clinic immediately in case of any problems.
- Researcher phone number was given to the patients of group one for any questions or clarifications

- Patients also followed through with phone calls

Group II (control group); those patients receiving their nutritional support at home diet.

The evaluation phase:

- Patients of both study and control groups were evaluated and assessed for three times using tools I and II.
  a. First time: immediately on the first visit to the clinic.
  b. Second time: one-month post the first visit.
  c. Third time: three months post the first visit.
- Comparison was done between the results of both groups to determine effectiveness of nutritional support on clinical outcomes of patients suffering from viral hepatitis C.

Statistical analysis:

- Data was collected, computed and statistically analyzed using SPSS (Statistical Package of Social Sciences) software program version 16.
- The following statistical tests were used for the comparison of groups:

1. Chi-square test to compare categorical variables of the groups.
2. Fisher exact test to compare categorical variable of the groups when an expected number in one cell is less than 5.
3. Student t-test to compare continuous numerical variables presented by mean, and stander deviation in two different groups.
4. Paired t-test to compare continuous numerical variable presented as mean stander division in one group in different occasions.

- The difference is considered significant where P≤0.05 **(Goodman, 2017 and Hematol, 2017).**

Results:

The data collected were analyzed statistically and the results are categorized into 7 main parts which are: sociodemographic characteristics, presence or absence mal nutrition, baseline laboratory findings, and laboratory findings after three months following diet regimen, anthropometric measurements, caloric intake, and severity of the disease.

Table 1: found that, 36.7% of the study group and 31.7 of the control group were in the 41-year age group. with a mean age of the study group and the control group 39±9.43, 36.5±10.98respectively. Regarding educational level, 26.7% of the study group was university educated and had no formal education, while 73.35% and 61.7% had poor income for study and control group respectively and also70.0 % and 85.0% live with their relatives for study and control group respectively. 61.7% for study group and 63.3% for control group were engaged in moderate activity when it came to activity. Finally 83.3% and 80.0% live in rural area for study and control group respectively.

Fig 1: showed that, 50% of the study groups were female compared to 48.3 in control group.

Fig 2: illustrated that according to marital status, 86.7 % of the study group were married compared to 76.7% for control group.

Fig 3: discovered that private occupations made up about 40.0% and 33.3% of all jobs for study group and control group respectively.

Table 2 demonstrated that, at baseline, 8.3% of the study group and 6.7% of the control group had signs and symptoms of malnutrition. This percentage decreased to 0.0% in the study group after one and at third month after the start of the diet program and to 5.0 and 6.7% in the control group. The significant difference was considered insignificant.

Table 3 revealed that, there is no statistically difference between the study group and control group as regard, the liver function test and complete blood count of the study group at the base line; before following diet regimen.

Table 4 revealed that, the liver function test and complete blood count of the study group after the three-month post-diet regimen were within the normal range. While mean and stander deviation for alkaline phosphatase and ALT were

(12.94±1.03 and 47.54±10.69). Moreover, hemoglobin levels and coagulation function represented (12.94±1.03 and 6.94±1.35).

Table 5: illustrated that, the weight of the study group decreased after one month and at the third visit post following the diet regimen but there was no significant difference with a mean of 81.8± 11.9 and 80.2±10.5 Although, Height of both groups did not significantly differ, it was noticed that, mid arm circumference and mid arm muscle circumference significantly decrease in the study group than the control group at the second visit after one month and at third visit after implementation of nutritional support. Moreover, BMI and TSF were significantly decreased in the study group compared to the control group at the third visit post following the diet regimen.

Table 6: showed that the daily caloric intake is greater than need in both groups (study and control) with a mean 2335.6± 533.0 and 2318.2±506.5 at the base line and they did not differ significantly. Moreover, at one month there is a decrease in daily caloric intake among study group with a mean 2006.7 ± 460.2 and the decrease become more at the third visit post instruction with a mean 1997.8±377.7 and the difference is significantly lower than control group.

Table 7: revealed that, there was improved score of child Pugh scale in the study group. At base line scale point 5(class A) was 81.7% and increased to 85% after one month and more proved to be 88.3% three- month post following the diet regimen. Moreover, it was found that, there were improved classes of child Pugh scale in the study group compared to a base line. There were two classes class A; which indicate stage I and class B; which indicated stage II which indicated the severity of the disease and after one month improved to be class A which indicated stage I. so the result was improved in the study group than in the control group the difference become high statistically significant after one-three months post following the diet regimen and also, the result of the two groups is considered in class A; which reflects the first stage of the disease with less complication.

Discussion:

Hepatitis C continues to cause substantial morbidity and mortality worldwide, and transmission continues unabated in many countries. Control of HCV infection requires a comprehensive approach to prevent infection **(WHO, 2013).**

Nutritional intervention by means of increased nutrient supply according body requirement, or modified eating patterns can improve nutritional status such as nitrogen balance, serum protein concentrations, anthropometric measures, mortality, energy expenditure and extra-hepatic tissue function **(Medhat et al., 2014)** More than half of the study and control groups were in the middle adult range, according to the study's findings. This finding is consistent with the **National Institutes of Health's (2002)** finding that many HCV infected people are in the 30–39 age brackets and may experience illness consequences over the following 10–20 years. Similarly, the current findings are consistent with those of **Medhat et al. (2014),** who noted that Egypt had the highest rates of HCV prevalence in the world among people over 30.

These results also contradicted **Roberts' (2013)** the assertion that liver illness might manifest itself in a myriad of ways. Regardless of age, nationality, lifestyle, or financial situation, it affects men and women as well as children. At the same point **International Conference on Emerging Infectious Diseases (2012)** reported that, an increased incidence of hepatitis C infections in people 15 to 34 years of age. According to estimates, 14.7% of those aged 15 to 59 have HCV.

The results of this study's gender-related analysis showed that women made up half of the study's participants. This may be because women are more likely to be exposed to blood-borne illnesses due to pregnancy, childbirth, and household duties, which puts them at a higher risk of contracting hepatitis C. This finding is consistent with **Iversen's (2010)** argument that women are more likely than men to share needles, syringes, and other supplies throughout the formative years, placing them at higher risk for contracting the

hepatitis C virus. According to our cultural milieu, girls are only sporadic and exposed to various risk factors, such as tattooing, injectable drug usage, and barbers, etc.

However, **Muhammed (2005)** stated that the prevalence of HCV was higher in males due to exposure to several risk factors as compared to females, which is consistent with another local study, and the results of the present study are at odds with that statement.

According to the study's findings about educational attainment, the majority of the subjects were illiterate. It's possible that this is connected to the fact that the majority of the study group was from rural areas with low socioeconomic status and was drawn to physical labor and farming. This is in harmony with; **Rajesh (2012),** the prevalence of the hepatitis C virus increased with lower monthly income and was higher in illiterate respondents. The risk factors for HCV infection in a rural Nile Delta hamlet with a high frequency of HCV antibodies were also described by **Mustafa et al. in 2011**. (Anti-HCV). Unemployment, inadequate education, and mental health concerns were all associated with a high prevalence of HCV **(Hahn et al., 2012).**

The current study showed that a significant portion of the study's participants were housewives; from my point of view this may be because half of the participants were women, who may have sedentary lifestyles or low levels of activity. Additionally, the study's findings were largely explained by private occupation. From my point of view this could be explained by the fact that the majority of the study's participants had low socioeconomic status, were not employed in line with their educational background, and had a low likelihood of finding employment in the public sector despite doing manual labor for private businesses.

According to **Dore et al. (2013)**, community or home transmission of HCV is thought to be extremely infrequent.

This finding is in line with that of **Strickland (2012)**, who concurred that epidemiological research had shown a high frequency and incidence of HCV, especially in rural families with endemic schistosomiasis. This finding is in line with that of **Strickland (2012)**, who concurred that epidemiological research had shown a high frequency and incidence of HCV, especially in rural families with endemic schistosomiasis. This is in line with **Frank et al (2010)**.'s assertion that extensive mass-control campaigns using parenteral tartar emetic, carried out from the 1950s to 1982, were responsible for the extremely high prevalence of HCV infection in the adult population of rural areas of Egypt, particularly in men living in villages where schistosomiasis is endemic.

A minority of the study groups were found to have malnutrition-related symptoms and indicators. This was consistent with the findings of **Alter et al. (2014)**, who discovered that risk factor screening is necessary to identify infection because symptoms are typically absent in people with chronic HCV infection. This screening should be carried out whenever it is possible to link it to appropriate HCV testing and counselling. Additionally, the results of the present study show that the majority of patients do not exhibit signs and symptoms of malnutrition. This finding agrees with **Teran and Mc Cullough (2011),** who noted that malnutrition frequently, coexists with increasing liver disease and has been proven to significantly increase the risk of morbidity and mortality.

Regarding biochemical parameters, the findings revealed no statistically significant differences found between the study and control group at the baseline assessment. However, post three months of implementation of the nutritional support, the serum albumin level, alkaline phosphate, ALT, AST, Hemoglobin, WBCs, RBCs, and coagulation function was statistically significant improved.

These findings were in the same line with the findings of Ratiu (2015), and Eisenmenger et al., (2017) who found statistically significant improvement in all biochemical parameters of the patients, post implementing the nutritional support. From my point of view these improvements could be due to nutritional support provide

essential nutrients as iron, copper, Vit A, D, E, K B6,B12.

This is in line with the findings of **Sulkowski et al. (2011)**, who show that baseline monitoring of hematologic and clinical chemistry laboratories is necessary to identify anemia or any other liver function test abnormalities to avoid treatment failures.

Regarding anthropometrics measurement, the result of the present study is in accordance with **McDowell et al. (2019)** reports that, A complete nutrition assessment includes a review of medical history and risk factors, medication profile, nutritional profile (including appropriate anthropometrics, body composition, evaluation of dietary intake, and comparison with estimated needs), biochemical evaluation, notation of psychosocial and economic conditions, changes in routine, symptoms that interfere with nutritional well-being, and prognosis. Similarly, Subjective global assessment when compared to anthropometry shows an agreement of 77% may prove a useful tool for screening of malnutrition but this approach fails to provide a sensitive quantitative nutritional measure change **(Fried et al., 2014).**

One of the limitations in providing dietary advice is that individuals have very different tolerances, requirements, likes and dislikes for certain foods. Therefore, assessment and modification of the diet may be necessary. It is useful to note reactions to foods to get an idea of individual tolerance. If fatty or rich foods create nausea they are not obviously tolerated well and so best to be avoided. A balanced diet is important for general health **(Ashton, 2013).**

The finding of the present study showed that, there are decreases in body weight, MAC, TSF, MAMC and BMI of the study group after following the diet regimen with the appropriate daily caloric intake in the different visits compared to control group. These results are in harmony with **Hickman et al. (2012)** who found that, ideal body weight may provide an important adjunct treatment strategy for patients with HCV. In overweight patients with steatosis who subsequently lose weight, also liver-related abnormalities improve.

On the other hand, obesity and its associated fatty liver disease are believed to play a role in the progression of fibrosis in HCV-infected individuals and response to treatment. Therefore, appropriate counsel to those who are overweight (defined by a raised body mass index of25 kg/m2 or more) to attempt to lose weight. Additionally, weight reduction and improvement in insulin resistance may improve the response to peg interferon plus ribavirin therapy **(Hourigan et al., 2018).**

Those finding are in accordance with **Mc Hutchison et al. (2017)** who commented that, A modified eating pattern with four to seven small meals including at least one late evening meal maintains ideal body weight and different body measurements and improves nitrogen economy and substrate utilization in stable cirrhotic patients. The particular weight challenge in hepatitis C patients varies from one person to another person and at different stages of the disease **(Heathcotte, 2016).** Thus, gradual weight loss of 10% of body weight should be the goal, through healthy eating and regular physical activity, not through fad diets **(Hwang et al., 2016).**

Concerning the control group, the present study found that, there is no improvement in anthropometric measurements, from my point of view this may be due to many reasons; absence of general guidelines for healthy eating according to caloric requirement; emotional status of the patient; presence of gastrointestinal problems; and use any medication that effect on the nutritional status and adversely effect on different body measurement.

The finding of the present study reveals that, there is change in daily calorie intake consumed by patients in study group in different visits. There is statistically significant difference between two groups after one month and highly statistically significant difference between two groups pre-diet regimen. Moreover, there is a highly statistically significance difference in the

caloric intake of the study group at the different visits.

This result comes in consistence with **Carl (2015)** who concluded that, sufficient calories are provided to maintain weight or address weight loss (at least 30 calories per kilogram of body weight). A liberal intake of complex carbohydrates and low fat yet adequate essential fatty acids is essential. A high-energy diet is normally recommended for HCV-infected persons.

Although Food and Nutrition Board; Institute of Medicine (2002) reported that, energy expenditure may vary considerably among patients with hepatitis C and among those with severe liver disease. Measured energy needs for those patients, even in the absence of cirrhosis, are on average higher per unit of lean body mass than the needs of healthy individuals. This increased energy needs appear to be higher with higher HCV viral loads 25 to 40 kcal/kg, based on weight or an adjusted ideal weight and add 20% to 40% to basal energy expenditure (BEE) using the Harris-Benedict equation. This is in disagrees with **(Arteh et al., 2010)** who clarified that; there is no benefit from rest, diet, or vitamin supplements.

The finding of the present study showed that, there was an improvement score of Child Pugh Scale in the study and control group. At base line there were three classes class (A) indicate stage I and class (B) indicates stage II and class (C)which indicate stage 3 which indicates the severity of the disease and after one – three months improved to presences of class (A) and class (B) that indicates stage 1and II. From my point of view, this may be due to availability of universal screening of blood and blood products; increased public awareness about risk factors; early detection and prevention of the disease; and availability of new diagnostic and treatment modalities.

This result was accordance with (**Hickman et al., 2012)** who stated that there was an improvement score of Child Pugh Scale in the study and control group compared to pre-implementation phase

This is in harmony with the result of the present study, the aim of nutritional support is to delay or minimize cirrhosis, liver failure or hepatocellular carcinoma development. Early diagnosis and detection are essential for an effective care for patients with hepatitis C virus. Arrange counsel with knowledge and experience of chronic HCV infection on the implications of HCV positivity and the risks of passing the infection **(European Association for the Study of the Liver, 2013)**

Conclusion:

Based on the present study findings, it can be concluded that: The study group return to the ideal body weight, the dietary habits changes to daily caloric requirement, stability of liver function test within normal range, free from signs and symptoms of malnutrition, and return to normal anthropometric measurements after one, three -month post diet regimen.

Recommendations:

- Diet for patients with hepatitis C should be prescribed individually based on total caloric requirement.
- Conference, workshops should be carried out for nurses to upgrade their level of knowledge related to nutritional support of patients with hepatitis C.
- Manual guidelines about allowed nutritional support of patients with hepatitis C should be available to every nurse caring for patients in liver disease unit.
- Colored booklet about daily caloric requirement, allowed, prohibited food should be distributed to each patient.
- A further study to be carried out in different settings on a longer sample for a wider utilization of the instructional guideline, in order to achieve generalization of the results.

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Table (1): Percentage distribution of patients of both groups according to their socio-demographic characteristics.

Items	Study group N=60		Control group N=60			
	No.	%	No.	%	X^2	P-value
Age group:						
21-	13	21.6	18	30.0		
31-	19	31.7	17	28.3	1.636	>0.05
41-	22	36.7	19	31.7		
51-60	6	10.0	6	10.0		
Mean ± SD	21-57 39±9.43		21-58 36.5±10.98			

Level of Education:						
Illiterate	16	26.7	18	30.0		
Read & write	14	23.3	11	18.3	1.282	> 0.05
Secondary	14	23.3	11	18.3		
University	16	26.7	20	33.3		
Income:						
Low	44	73.3	37	61.7		
Moderate	16	26.7	21	35.0	3.281	>0.05
High	0.0	0.0	2	3.3		
Living status:						
Alone	3	5.0	3	5.0		
With family	42	70.0	51	85.0	4.728	>0.05
With other	15	25.0	6	10.0		
Daily activities:						
Mild	13	21.7	12	20.0		
Moderate	37	61.7	38	63.3	0.053	>0.05
Sever	10	16.7	10	16.7		
Place of residence						
Urban	10	16.7	12	20.0	0.041	>0.05
Rural	50	83.3	48	80.0		

Figure (1): Percentage distribution of patients of both groups according to their gender.

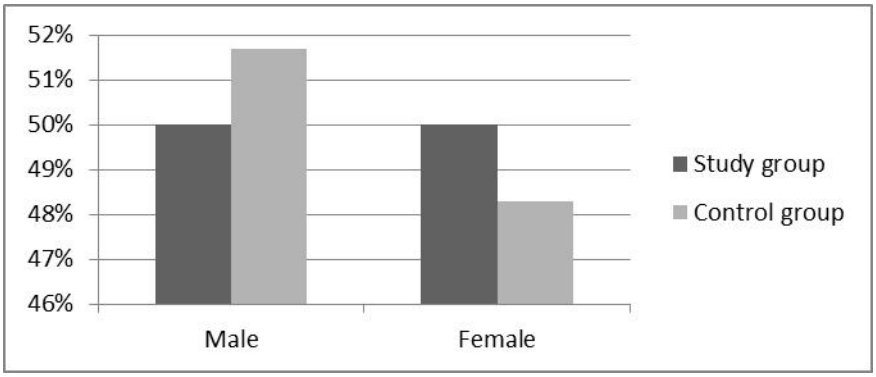

Figure (2): Percentage distribution of patients of both groups according to their marital Status.

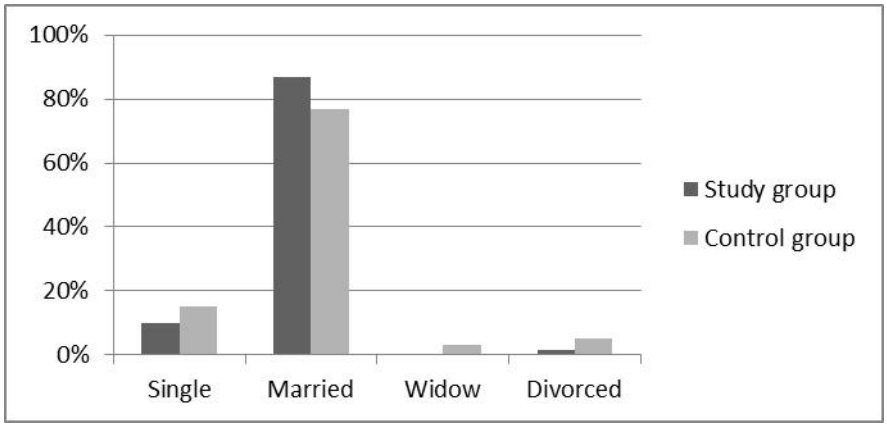

Figure (3): Percentage distribution of patients of both groups according to their occupation**.**

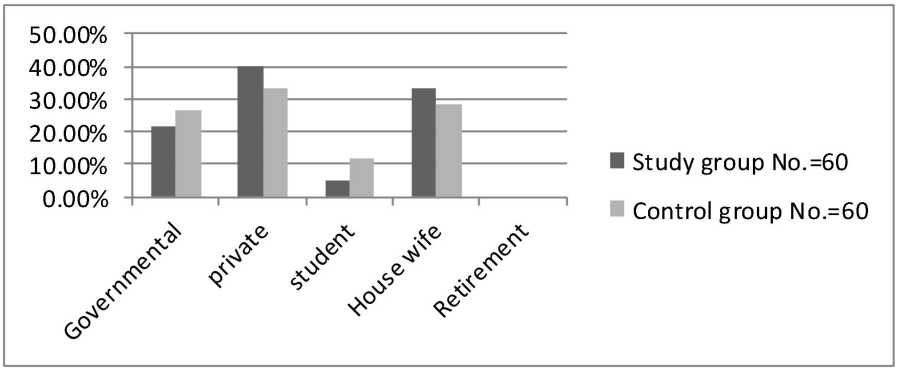

Table (2): Percentage distribution of patients suffering from viral hepatitis C according to dietary history and presence or absence of malnutrition.

items		Groups				X^2	P-value
		Study group N=60		Control group N=60			
		No	%	No	%		
On admission	Yes	5	8.3	4	6.7	0.12	>0.05
	No	55	91.7	56	93.3		
After one month	Yes	0.0	0.0	3	5.0	FE test	>0.05
	No	60	100	57	95.0		
After three months	Yes	0.0	0.0	4	6.7	FE test	>0.05
	No	60	100	56	93.3		

Table (3): Baseline biochemical tests for both study and control groups with viral hepatitis C.

	Study groups(n=60)	**Control groups (n=60)**	**T-test**	**P-value**
	Mean ±SD	Mean ±SD		
Serum albumin	0.78±0.17	0.81±0.18	0.732	0.467
Alkaline phosphate	13.06±1.68	12.86±0.79	0.623	0.313
ALT	52.00±13.21	52.80±11.59	0.432	0.702
AST	53.33±0.03	52.33±2.08	0.409	0.713
Hemoglobin	12.86±0.79	13.06±1.68	0.623	0.313
Coagulation function	8.36±6.40	9.86±6.28	0.581	0.364
RBCs	3.27±0.31	3.33±0.17	1.457	0.239
WBCs	8.36±6.40	9.86±6.28	0.581	0.364

Table (4) Biochemical tests for both study and control groups 3 months postnutritional support implementation

	Study groups(n=60)	**Control groups (n=60)**	**T-test**	**P-value**
	Mean ±SD	Mean ±SD		
Serum albumin	0.87±0.20	1.39±0.37	2.513	0.018*
Alkaline phosphate	12.94±1.03	11.76±1.10	4.294	0.000**
ALT	47.54±10.69	79.45±7.59	-5.29	<0.1001**
AST	37.33±7.93	51.66±8.62	-6.72	<0.05*
Hemoglobin	12.94±1.03	11.76±1.10	4.294	0.000**
RBCs	4.39±0.56 4.35±0.65	3.36±0.16 3.99±0.16	4.084 4.084	0.019* 0.019*
WBCs	6.94±1.35	21.72±8.1	-3.581	<0.1001**
Coagulation function				

* Significant at 0.05 level

Table (5): Mean and Standard deviation for both Study and Control groups in relation to anthropometric measurement at different visits (First, one- and three-month post instructions).

Anthropometric measurement	First visit		T&P	Post implementation of nutritional support					
	Baseline			One-month post instructions		T&P	Three-month post instructions		
	Study group N=60	Control group N=60		Study group N=60	Control group N=60		Study group N=60	Control group N=60	T&P
	Mean± SD	Mean± SD		Mean± SD	Mean± SD		Mean± SD	Mean± SD	
Weight(kg)	84.9 ±12.1	82.1 ±10.6	1.09 >0.05	81.8 ±11.9	82.4 ±10.7	0.274 >0.05	80.2 ±10.5	83.5 ±10.5	1.710 >0.05
Height(cm)	168.43 ±6.7	168.45 ±8.1	0.086 >0.05						
MAC	32.4±5.4	27.5±5.1	5.116 ≤0.001**	31.8±5.8	27.54 ±5.1	4.494 0.000**	30.56±5.7	28.18±5.14	2.393 ≤ 0.05*
MAMC	27.5±5.6	22.6±5.3	4.926 <0.001**	27.4±6...5	22.8±5.1	4.300 0.000**	25.52±6.3	23.2±5.2	2.232 ≤ 0.05*
TSF	14.54±6.7	15.5±5.0	0.031 >0.05	14.11±6.5	15.52±4.9	1.348 >0.05	13.6±5.8	15.9±5.1	2.333 ≤0.05*
BMI	28.12±4.2	28.6±3.3	0.749 >0.05	27.6±3.8	28.9±4.2	1.826 >0.05	27.6±3.8	26.8±3.7	3.245 ≤0.001**

* Significant P < 0.05 ** highly significant P < 0.001(HS)

Table (6): The effect of diet regimen on the daily caloric intake among Study and Control groups in relation to anthropometric measurement at different visits (First, one- and three-month post instructions).

Daily caloric	Groups		t	P
	Study group N=60	Control group N=60		
	Mean± SD	Mean± SD		
Needed	1672.2±288.1	1723.4±202.7	1.126	>0.05
Baseline	2335.6±533.0	2318.2±506.5	0.183	>0.05
One-month post instructions	2006.7±460.2	2288.3±498.6	3.216	≤0.001**
Three-month post instructions	1997.8±377.7	2326.7±502.3	4.054	0.000**

t 1	5.520	1.767	
p	0.000**	>0.05	
t 2	6.734	0.612	
p	0.000**	>0.05	
t 3	0.244	3.593	
p	>0.05	≤0.001**	

* Significant P < 0.05 ** highly significant P < 0.001(HS)t 1=comparison b\w baseline vs. one-month post instructions

t 2= comparison b\w baseline vs. three-month post instructions t 3= comparison b\w month post instructions vs. three-month post instruction

Table (7): Degree of severity of disease for patients with hepatitis c virus of both groups at different visits (First, one- and three-month post

Child Pugh scale		Groups				X^2	P-value
		Study group N=60		Control group N=60			
		No	%	No	%		
Baseline	5	49	81.7	45	75	2.844	>0.05
	6	9	15	10	16.7		
	7-9	2	3.3	5	8.3		
One-month post instructions	5	51	85	35	58.3	10.506	≤0.001**
	6	9	15	25	41.7		
three-month post instructions	5	53	88.3	33	55	16.416	≤0.001**
	6	7	11.7	27	45		

The child Pugh is categorizing patients into three classes from A to C: - class A= 5-6 point indicate stage I

-Class B= 7-9 Point indicate stage II

Class C= 10-15 point indicate stage III.

* Significant P < 0.05 ** highly significant P < 0.001(HS)