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The Impact of using high protein diet followed by planned exercise in chronic liver disease patients using by Bio Electrical Impedance Analysis BIA.

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Abstract:

The study conducted in NLI on (30) chiwroteic patient vist one nutritional state assessted by:Protein energy Malnutrition (PEM) is a common nutritional defect in Cirrhotic patients, with increased risk of mortality and morbidity. Simple bedside tools to identify malnutrition are essential to improve the prognosis and quality of. The main objective of this study is to improve the functional status of patients with chronic liver disease by using a high protein meal followed by planned exercises, to increase muscle mass., Determine the effect of this technique assisted by Bio electrical Impedance Analysis (BIA) 30 Cases are rolled in National Liver Institute, Menoufia University (2017-2019) child (A-B) cirrhotic parameters were collected using the results indicated that: Both groups were assessed by: (NRS)Nutritional risk screening, (SGA) Subjective global assessment, (ALT)Alanine Amino Transferase,(AST) Aspartate Amino Transferase, (AIB)Albumin,(WR) Water, (T-BIL)Total Bilirubin,(D-BIL) Direct Bilirubin,(Ht)Height, (Wt)Weight,(BMI) Body mass index, (BIA)Bio Electrical Impedance Analysis, (CARB)Carbohydrate, (P)Protein, (CRIT) Creatine, (F)FAT, (Fat M) Fat Mass, (V FatL)Visceral Fat Level, (FFM)Fat Free Mass,(TBW)Body Water, (BMR) Basal Metabolic Rate, (MAC) Mid arm circumference,(TSF)Tricipes skin fold, (WL) Waist Circumference, (6 MWT) 6 min wake test.

Key words: (Ht), (Wt), (BMI), (BIA), (MAC), (TSF), (WL), (6 MWT).(Ht), (Wt), (BMI), (BIA), (MAC), (TSF), (WL), (6 MWT) (ALT), (AST), (AIB), (T-BIL), (D-BIL), (CRIT)

Introduction:

Nutritional status is directly associated with survival in cirrhotic patients (**Ruiz-Margain et al., 2015**). Malnutrition is prevalent in all forms of liver disease: from 20% in compensated liver disease to more than 80% in those patients with decompensated liver disease (**Teiusanu et al., 2012**). Protein energy Malnutrition PEM is a commonly associated condition to all stages of (CLD) and may be present in 65–90% of patients with advanced disease. Malnutrition develops at an early stage of liver disease and there is, almost, a direct relationship between the severity of liver disease and the degree of malnutrition. There are many factors that contribute to malnutrition in patient with liver disease; malabsorption due pancreatic insufficiency, cholestasis, porto-systemic shunt, bile deficiency with inadequate absorption of long-chain fatty acids or metabolic alterations (high protein catabolism reduced glucose homeostasis due to alterations of gluconeogenesis). Low glycogen stores and pro-inflammatory cytokines (**Aqel et al., 2005**) of PEM is associated with an increased risk of morbidity and mortality in patients with cirrhosis and occurs in 50%-90% of these patients. The development of other life-threatening complications of liver disease such as refractory ascites, spontaneous bacterial peritonitis, hepatorenal syndrome, variceal hemorrhage, and post-transplant mortality are also significantly greater in patients with PEM (**Cheunget al., 2012**). There were many suggested parameters to assess the nutritional status of cirrhotic patients and to identify malnourished patients or the risk for malnutrition. A staged approach (beginning with a complete history and proceeding with more detailed testing if needed) is suggested in nutritional assessment. In this study, parameters including (BMI), (MMA), (SGA), (NRS), Muscle Strength Assessment by hand dynamometry, phase angle obtained from (BIA).

Patients and Methods: After approval of ethical comity and a written consent obtained from the patient, the study was conducted at the Clinical Nutrition Department National liver institute Menoufia University, between November 2017 to November 2018, a total of (30) patients of both sex was included, three were excluded due to liver decompensation. Patients were divided equally into two groups observational prospective study.

Methods:

The basal diet in the experiment consisted:

- A planned high protein diet specifications for every case increasingly the protein to 1.5 g /kg/ day and the calories to 1.2 to 1.3 according to the activities of cases individually followed by planned exercises.
- BMR x1.3 or1.5.
- Carbohydrate diet 70 % and Fat 30 %
- Visit 1: (Ht), (Wt), (BMI), (BIA), (MAC), (TSF), (WL), (6 MWT).
- Visit 2: (Ht), (Wt), (BMI), (BIA), (MAC), (TSF), (WL), (6 MWT)

Analysis:

(ALT), (AST), (AlB), (T-BIL), (D-BIL), (CRIT) During one month all parameters were record.

Method designincluding:Weight, height, BMI, SGA



Figure (1) shows the steps of measuring MAC of the patients (Khalil SSet al., 2015) ⁽⁵⁾



Figure (2) shows the steps of measuring TSF of the patients(Khalil SSet al., 2015) ⁽⁵⁾



Figure (3) Tanita MC-780 MA

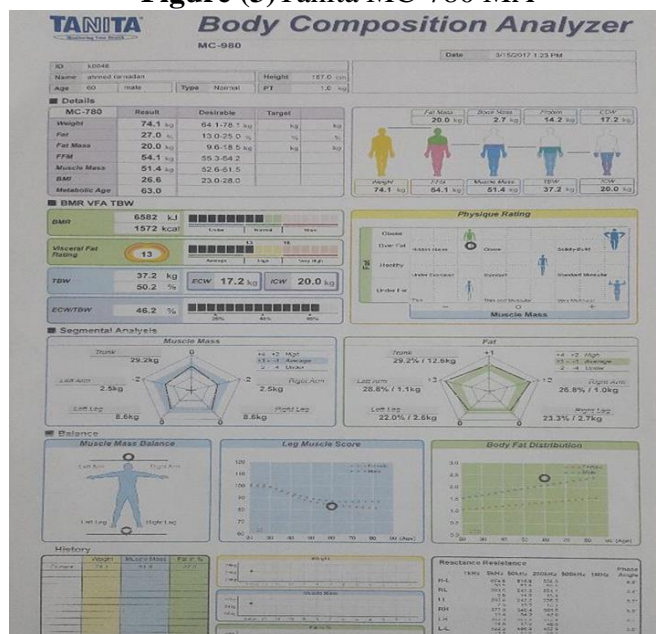


Figure (4) Printed sheet of BIA

Height: _____ Admit weight: _____ Body mass index: _____

A. History

1. **Weight (wt) change:**
In the past 2 weeks, weight has: increased/decreased/not changed
Overall weight loss in the past 6 months: _____ kg:
_____ %.
2. **Change in dietary intake (relative to normal intake):** circle
No change Borderline/poor Unable to eat
If intake has decreased, for how long: _____ weeks.
3. **Gastrointestinal symptoms (> 2 weeks):** circle all that apply
None Nausea Vomiting Diarrhea Anorexia
4. **Functional capacity:** circle
No change Decreased activities of daily living Bed ridden
5. **Metabolic stress:** circle
No stress Low/moderate stress High stress

B. **Physical examination: check all that apply**
 Triceps and chest subcutaneous fat loss
 Quadriceps and deltoid muscle wasting
 Ankle edema
 Sacral edema
 Ascites

C. **SGA rating: check one**
 A = well nourished
 B = moderately malnourished
 C = severely malnourished

Figure (5) SGA

Results and Discussion:

Conventional methods group

The tables (1), (2) and (3) shows a descriptive statistics for investigated parameters of 30 patients included in this study.

The table (1) and Figures (6), (7), (8) shows a paired t-test were used to obtain the differences for parameters before and after diet with confidence interval percentage 95% as shown in the first table. Most of parameters are less than 0.05 which mean that there is statically difference between the two groups pre and post, the highest difference was in carbohydrates.As shown there was a significant difference between Control groups and the other treatments pre, post. On the other hand, there was a significant $P \leq 0.05$ their values as following from group (1), it was pre Weight, BMI, Protein, carbohydrates, Fat, Water, Waist circumference, TSF (L), TSF (R), MAC (L), MAC (R), 6 min wake test, were 71.8 ± 13.5 , 26.21 ± 4.8 , 84.6 ± 15.9 , 233.5 ± 29.6 , 42.5 ± 5.05 , 1746.7 ± 313.7 , 92.4 ± 11.6 , 6.07 ± 5.06 , 5.63 ± 5.15 , 28.2 ± 2.65 , 28.2 ± 2.55 ,

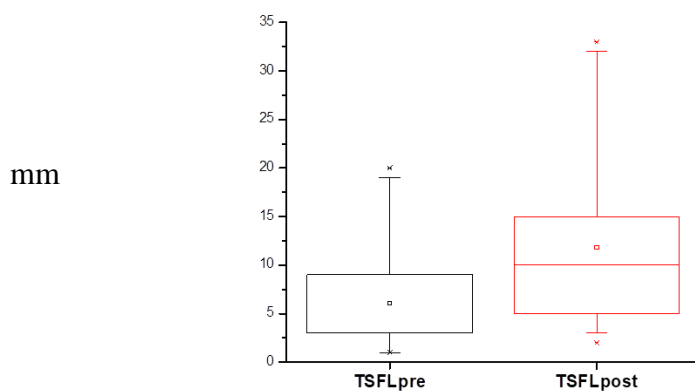
339.2±89.24 while for BMR [kcal] pre there was no significant their as following from group (1) values 1516.1±238.15 their values as following from group (1), it was post a Significant P<0.05) Weight, BMI, Protein, Carb, Fat, Water, Waist circumference, TSF (L), TSF (R), MAC (L), MAC (R), 6 min wake test were 76.2±13.8, 27.96±5.015, 90.8±16.5, 254.9±35.07, 46.09±4.8, 1870±320.7, 99.9±12.63, 11.8±8.47, 11.33±7.83, 30.6±3.6, 30.33±3.5, 504.4±66.32 respectively while for BMR[kcal] post there was no a significant their as following from group (1) value was 1556.9±225.7 Malnutrition assessed through phase angle and its relation to prognosis in patients with compensated liver cirrhosis: a prospective cohort study. Dig Liver Dis (Ruiz-Margain et al., 2015). Nutritional status in cirrhotic patients. Maedica (Buchar) (Teiusanu Aet al., 2012). Nutrition in Chronic Liver Disease. GE Portuguese Journal of Gastroenterology (Silva Met al., 2015)

Table (1) and Figure (6) : TSFL (mm) and Figure (7) TSFR(mm) and Figure (8) Carb pre and post: Anthropometric measures of group (1)

Group (1)	Unit	Pre Mean ± SD	Post Mean ± SD	No	%	P value
Age Range:		41.1±11.4 ^a	41.1±11.45 ^a	27-59		
sex:						
Male				11	30	
Female				19	70	
Height Range:	Cm	163.7±9.5 ^a	162.4±8.7 ^a	150-193		
sex:						
Male				11	30	
Female				19	70	
Weight	Kg	71.8±13.5 ^a	76.2±13.8 ^a			3.02E-06
BMI		26.21±4.8 ^a	27.96±5.015 ^a			4.69E-11
BMR[kcal]	Kj	1516.1±238.15 ^b	1556.9±225.7 ^b			0.058621252
Protein	G	84.6±15.9 ^a	90.8±16.5 ^a			2.32E-05
Carb	G	233.5±29.6 ^a	254.9±35.07 ^a			8.67E-16
FAT	%	42.5±5.05 ^a	46.09±4.8 ^a			2.81E-08
Water	Kg	1746.7±313.7 ^a	1870.0±320.7 ^a			8.39E-04
Waist circumference	Cm	92.4±11.6 ^a	99.9±12.63 ^a			1.10E-09

TSF (L)	Mm	6.07±5.06 ^a	11.8±8.47 ^a		1.84E-05
TSF (R)	Mm	5.63±5.15 ^a	11.33±7.83 ^a		6.42E-06
MAC (L)	Cm	28.2±2.65 ^a	30.6±3.6 ^a		1.79E-06
MAC (R)	Cm	28.2±2.55 ^a	30.33±3.5 ^a		3.29E-07
6 min wake test	M	399.2±89.24 ^a	504.4±66.32 ^a		6.41E-10

Means with different letters in the same column are different significantly at $P \leq 0.05$



Figure(6) Shows a box plot of TSFL pre= 6.07±5.06 and TSFL post = 11.8±8.5

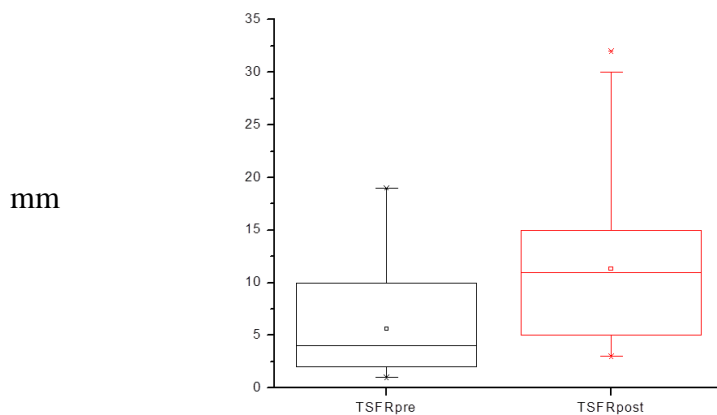


Figure (7) Shows a box plot of TSFR pre= 5.6±5.15 and TSFR post = 11.33±7.83

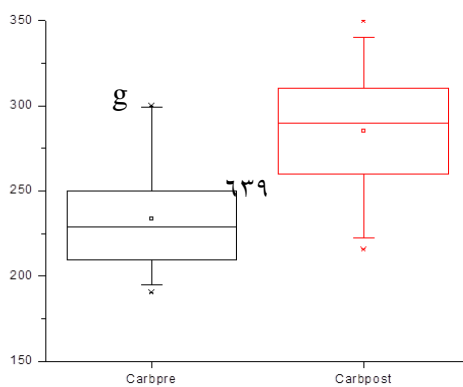


Figure (8) Shows a box plot of Carb pre = 233.5 ± 29.6 and Carb post = 284.9 ± 35.07

The table (2) and Figure (9) shows a Paired t-test were used to obtain the differences for parameters before and after diet with confidence interval percentage 95% as shown in second table. Only 2 parameters were statically stable and did not show difference between the two group the most stable parameter which data was AST in tables (2) and VFatL tables (3) with significance level = 0.92 and 0.85, respectively, it was preSignificant $P \leq 0.05$) Bil Direct, ALT, ALB, Crit, Urea. $405 \pm .23$, 27.133 ± 15.25 , $3.806 \pm .45$, $0.8 \pm .18$, 24.133 ± 6.56 respectively while, Bil Total, AST pre. There was no significant their as following from group (2) values. $.68 \pm .44$, 27.33 ± 11.12 their values as following from group (2), it was postSignificant $P \leq 0.05$) Bil Direct, ALT, ALB, Crit, Urea, $0.49 \pm .208$, 25.233 ± 7.24 , 4.05 ± 0.46 , $1.01 \pm .216$, 27.133 ± 6.9 while AST, Bil Total post. There was no significant their as following from group (2) values $0.79 \pm .27$, 27.5 ± 6.78 Bioelectrical impedance phase angle as a prognostic indicator in advanced pancreatic cancer (**Gupta Det al., 2004**). Norms and correlates of bioimpedance phase angle in healthy human subjects, hospitalized patients, and patients with liver cirrhosis (**Selberg Oet al., 2002**). Nutrition assessment and its effect on various clinical variables among patients undergoing liver transplant. Hepatobiliary (**Bakshi Net al., 2016**)

Table (2) and Figure (9): AST(U/L) pre and post Laboratory analysis of group (2)

Group (2)	Unit	Pre Mean \pm SD	Post Mean \pm SD	P value
Bil Total	Mg/dl	$.68 \pm .44^b$	$.79 \pm .27^b$	0.050856048
Bil Direct	Mg/dl	$.405 \pm .23^a$	$.49 \pm .208^a$	0.027028988

ALT	U/L	27.133±15.25 ^a	25.233±7.24 ^a	0.427847688
AST	U/L	27.33±12 ^b	27.5±6.78 ^b	0.92528076
ALB	Mg/dl	3.806±.45 ^a	4.05±.46 ^a	8.85E-07
Crit	Mg/dl	.8±.18 ^a	1.01±.216 ^a	7.09E-11
Urea	Mg/dl	24.133±6.56 ^a	27.133±6.9 ^a	5.20E-08

Means with different letters in the same column are different significantly at $P \leq 0.05$

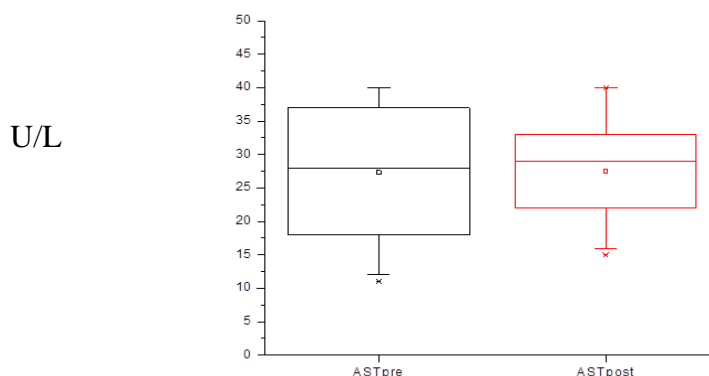


Figure (9) shows a box plot of AST pre and post diet with mean =27.33±11.12 and 27.49±6.78, respectively.

The table (3) and Figures (10), (11) shows a Paired t-test were used to obtain the differences for parameters before and after diet with confidence interval percentage 95% as shown in second table. Most of parameters are less than 0.05 which mean that there is statically difference between the groups (3) (pre, Post) the highest difference was in RA FFM.it was preSignificant $P \leq 0.05$) Fat M,

FFM, TBW, Phase, LL Fat M, LL FFM, RA Fat M, RAFFM, LA Fat M, LA FFM 22.24±8.64, 52.56±8.95, 37.86±6.42, 5.4±1.12, 2.8±1.82, 6.78±2.6, 1.4±.89, 2.6±6.14, 1.213±0.82, 2.31±0.72 respectively while VFATL pre There was no significance their as following from group (3) values 6.366±3.62 their values as following from group (3), it was Significant $P \leq 0.05$) Fat M, FFM, TBW, Phase, LL Fat M, LL FFM, RA Fat M, RAFFM, LA Fat M, LA FFM 24.9±8.406, 60.75±12.94, 44.52±9.1, 5.86±0.8, 4.4±1.9, 9.5±1.92, 14.23±6.83, 25.5±8.97, 2.06±1.134, 3.08±0.8 respectively while VFATL post There was no significant their as following from group (2) values 6.43±3.69 Anthropometric Nutritional support in patients with chronic liver disease. Nat Clin Pract Gastroenterol Hepatol (Henkel AS et al., 2006)

.Validity of mid-arm muscular area measured by anthropometry in nonobese patients with increased muscle atrophy and variation of subcutaneous fat thickness (Saito R et al., 2010). Anthropometric midarm measurements can detect systemic fat-free mass depletion in patients with chronic obstructive pulmonary disease (Sanchez FF et al., 2011).

Table (3) and Figures (10):VFatL (Level)and Figure(11) RAFFM (Kg) pre and post:Relationship between nutritional assessment before and after experienceof group (3)

Group (3)	Unit	Pre Mean ± SD	Post Mean ± SD	P value
FatM	Kg	22.24±8.64 ^a	24.9±8.406 ^a	8.86E-07
V Fat L	(Level)	6.366±3.62 ^b	6.43±3.69 ^b	0.853804563
FFM	Kg	52.56±8.95 ^a	60.75±12.94 ^a	4.85E-05
TBW	Kg	37.86±6.42 ^a	44.52±9.1 ^a	2.32E-05
Phase angle		5.4±1.12 ^a	5.86±.8 ^a	0.034007097
LL FatM	Kg	2.8±1.82 ^a	4.4±1.9 ^a	1.24E-08
LL FFM	Kg	6.78±2.6 ^a	9.5±1.92 ^a	1.73E-06
RA FatM	Kg	1.4±.89 ^a	14.23±6.83 ^a	1.97E-11
RAFFM	Kg	2.7±.614 ^a	25.5±8.97 ^a	7.76E-15
LA FatM	Kg	1.213±.82 ^a	2.067±1.134 ^a	3.81E-06
LA FFM	Kg	2.31±.72 ^a	3.08±.8 ^a	1.49E-06

Means with different letters in the same column are different significantly at P≤0.05)

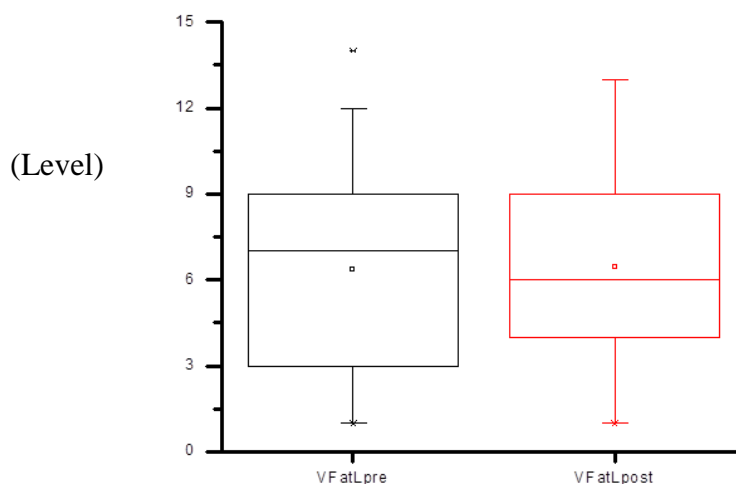


Figure (10) Shows a box plot of VFatL pre= 6.37±3.62 and VFatL post = 6.43±3.69

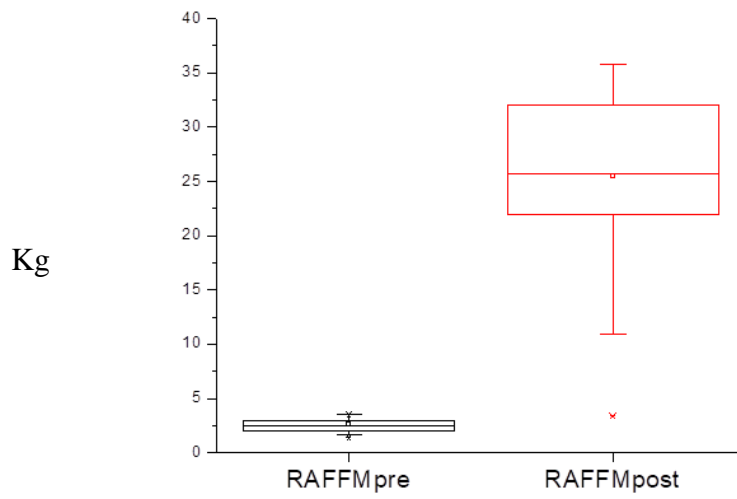


Figure (11) Shows a box plot of RAFFM pre= 2.6 ± 0.614 and RAFFM post = 25.46 ± 8.97

التوصيات :

هناك مجموعة متزايدة من الأدلة على أن العادات الغذائية الخاطئة في المرضى الذين يعانون من سوء تغذية قد يكون لها تأثير كبير على الحالة الصحية للمريض لذلك يجب إعطاء نصيحة حول تعديل الحالة الغذائية الصحية لمساعدتهم على إجراء تغييرات إيجابية قد تحسن فرصهم في تحسين حالتهم الصحية .
لذلك يجب إعداد برامج غذائية لشرح وتفسير خطر العادات الغذائية الخاطئة في المرضى الذين يعانون من سوء تغذية قد يكون لها تأثير كبير على الحالة الصحية للمريض .

References

- Aqel BA, Scolapio JS, Dickson RC, Burton DD, Bouras EP. (2005):** Contribution of ascites to impaired gastric function and nutritional intake in patients with cirrhosis and ascites. *ClinGastroenterol Hepatol*;3:1095-1100.
- Bakshi N, Singh K.(2016):**Nutrition assessment and its effect on various clinical variables among patients undergoing liver transplant. *HepatobiliarySurg Nutr*;5:358-371.
- Cheung K, Lee SS, Raman M. (2012):**Prevalence and mechanisms of malnutrition in patients with advanced liver disease, and nutrition management strategies. *ClinGastroenterol Hepatol*;10:117-125.
- Gupta D, Lis CG, Dahlk SL, Vashi PG, Grutsch JF, Lammersfeld CA. (2004):** Bioelectrical impedance phase angle as a prognostic indicator in advanced pancreatic cancer. *Br J Nutr*;92:957-962.
- Henkel AS, Buchman AL. (2006):**Nutritional support in patients with chronic liver disease. *Nat ClinPractGastroenterol Hepatol*;3:202-209.
- Khalil SS, Youssef MKE-S, Mekkawy MM. (2015):** Liver Cirrhosis: Impact Of Nutritional Regimen On Patients Outcome. *Journal of Nursing and Health Science*;4:22-35.
- Ruiz-Margain A, Macias-Rodriguez RU, Duarte-Rojo A, Rios-Torres SL, Espinosa-Cuevas A, Torre A. (2015):**Malnutrition assessed through phase angle and its

relation to prognosis in patients with compensated liver cirrhosis: a prospective cohort study. *Dig Liver Dis*;47:309-314.

Saito R, Ohkawa S, Ichinose S, Nishikino M, Ikegaya N, Kumagai H. (2010):Validity of mid-arm muscular area measured by anthropometry in nonobese patients with increased muscle atrophy and variation of subcutaneous fat thickness. *Eur J Clin Nutr*;64:899-904.

Sanchez FF, Faganello MM, Tanni SE, Lucheta PA, Pelegriño NG, Hasegawa SH et al. (2011):Anthropometric midarm measurements can detect systemic fat-free mass depletion in patients with chronic obstructive pulmonary disease. *Braz J Med Biol Res*;44:453-459.

Selberg O, Selberg D. (2002):Norms and correlates of bioimpedance phase angle in healthy human subjects, hospitalized patients, and patients with liver cirrhosis. *Eur J Appl Physiol*;86:509-516.

Silva M, Gomes S, Peixoto A, Torres-Ramalho P, Cardoso H, Azevedo R et al. (2015):Nutrition in Chronic Liver Disease. *GE Portuguese Journal of Gastroenterology*;22:268-276.

Teiusanu A, Andrei M, Arbanas T, Nicolaie T, Diculescu M. (2012): Nutritional status in cirrhotic patients. *Maedica (Buchar)*;7:284-289.



تحديد تأثير استخدام وجبة عالية البروتين يتبعها تمارين رياضية لزيادته الكتلة العضلية لمرضى الكبد المزمن باستخدام جهاز كتله الجسم BIA

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ميمونه عبد الواحد الخليفة^٤

أستاذ التغذية وعلوم الأظعمه و عميد كلية الإقتصاد المنزلي سابقا جامعه المنوفيه^١، أستاذ بقسم طب الكبد بمعهد الكبد القومي جامعه المنوفيه^٢، مدرس تخدير بمعهد الكبد القومي دكتوراه التخدير والرعاية المركزة دبلوم الأوربية للتغذية جامعه المنوفيه^٣، قسم التغذية وعلوم الأظعمه – كلية الإقتصاد المنزلي- جامعه المنوفيه – شبين الكوم^٤

الملخص العربي

لذلك فإن الهدف الرئيسي من هذه الدراسة هو تحسين الحالة الوظيفية للكبد لدي المرضى الذين يعانون من مرض الكبد المزمن وذلك باستخدام جهاز المعاونه الكهربائيه البيولوجيه BIA وذلك في مستشفى معهد الكبد القومي بشبين الكوم جامعه المنوفيه.

وتشتمل الدراسة علي ٣٠ حاله مقسمه إلي ثلاث مجموعات قبل وبعد :

- ١- المجموعه الاولى: المقاييس النثومتريه (Age و Height و Weight و BMR [kcal] و Protein و Carb و FAT و Water Waist circumference و TSF (L) و TSF (R) و MAC (L) و MAC (R) و min wake test و BMI) قبل التجربه وقبل تناول الوجبه الغذائيه المخططه.
- ٢- المجموعه الثانيه: التحاليل المعملية (Bil Total و Bil Direct و AST و ALB و Urea و ALT) بعد التجربه وبعد تناول الوجبه الغذائيه المخططه.
- ٣- المجموعه الثالثه: التقييم الغذائى للمريض باستخدام جهاز BIA (FatM و Fat V و LL و FFM و TBW و Phase angle و RA FatM و LA FFM و RAFFM و LL FatM و LL و FFM) قبل التجربه وقبل تناول الوجبه الغذائيه المخططه.

يتم تخطيط الوجبه الغذائيه بالصوره التي يمكن إعطائها للمرضي المصابين بالتهاب كبدي فيروسي (سي وبى). وتجري الدراسة علي المرضى المصابين بالتهاب كبدي فيروسي ممن يتابعون بمعهد الكبد القومي بشبين الكوم ويتم إعطاء المريض الوجبه الغذائيه المخططه لمدة شهر.

وأشتملت الدراسة علي تصميم إستبيان تتكون من ستة أجزاء وهي علي التوالى:

- ١- إستماره الحاله الاجتماعيه والاقتصاديه: وتشمل – إسم المريض – السن – محل الإقامة – الحاله الاجتماعيه – الحاله التعليميه – الحاله الوظيفيه – الدخل الشهري .
- ٢- إستماره الحاله الصحيه: وتشمل الأعراض المصاحبه لإكتشاف المرض :
 - ١- هل أنت خسيت . ٢- هل أكلك قل . ٣- هل عندك مشكله طبيه مزمنه . ٤- الناس قالت أنك خسيت . ٥- ليسك وسع عليك .
- ٣- أخذ ودراسه المقاييس الجسميه: من حيث الوزن والطول وكتله الجسم ومحيط الزراع سمك طبقه الجلد.

- ٤- أخذ عينات الدم : التعرف علي نسبة كل من الألبومين والبروتين (المباشر – المباشر وغير المباشر) وال (ALT) وال (AST).
- ٥- التعرف علي العادات الغذائية: كالأطعمه والمشروبات المفضل تناولها و نوع الدهون المستخدمه وأيضا الحساسيه الغذائيه.
- ٦- التعرف علي أنماط الأستهلاك الغذائي: باستخدام طريقه سرد ما تم تناوله وذلك باستخدام جدول تحليل الأطمعه ثم تحويل ما تم تناوله من أطمعه إلي الكميات المرادفه من العناصر الغذائيه المختلفه.
- وقد أوضحت النتائج ما يلي:

- نلاحظ أنه في الجدول الاول والثاني والثالث التجارب التي تمت علي ٣٠ حاله من المرضي الذين يعانون من مرض الكبد المزمن وذلك باستخدام جهاز BIA وذلك في مستشفى معهد الكبد القومي بشبين الكوم جامعه المنوفية.
- فقد نلاحظ في الجدول الاول أنه يوجد فرق معنوي في كل من الوزن و (BMI) مؤشر كتلة الجسم والبروتين والكربوهيدرات والدهون والمياه ومحيط الخصر و (TSF) قياس عضله الزراع (الشوكه) وقياس محيط الزراع والمشي لمدته ٦ دقائق بينما [BMR[kcal] معدل الايض القاعدي لا يوجد فرق معنوي ولاحظ أيضا أنه في الجدول الاول يوجد إرتفاع واضح في مستوي الكربوهيدرات بعد تناول الوجبه الغذائيه المخططه .
- ونلاحظ أيضا في الجدول الثاني أنه يوجد فرق معنوي في كل من البيلوربين المباشر و ALT والايومين والكيراتين واليوربا بعد تناول الوجبه الغذائيه المخططه بينما ال AST و البليروبين الكلي يوجد فرق غي معنوي بعد تناول الوجبه الغذائيه المخططه ونلاحظ أيضا ال AST في الجدول الثاني وال (VFatL) الدهون في الكرش أنه يوجد فرق واضح بينهم .
- كما نلاحظ أيضا في الجدول الثالث أنه يوجد فرق معنوي في كل من (FatM) كتلة الدهون و (FFM) الكتلة الخالية من الدهون (TBW) (المياه في الجسم و Phase angle و LLFFM و LAFatM و RAFFM و LAFatM و RAFFM بعد تناول الوجبه الغذائيه المخططه بينما في ال (VFatL) الدهون في الكرش يوجد فرق غير معنوي بعد تناول الوجبه الغذائيه المخططه كما نلاحظ أيضا أنه يوجد إرتفاع واضح في ال RAFFM بعد تناول الوجبه الغذائيه المخططه .
- ونلاحظ أيضا في الرسم الأول بيوضح طريقه قياس محيط الزراع.
- أما في الرسم الثاني بيوضح طريقه قياس عضله الزراع.
- ونلاحظ في الرسم الثالث بيوضح جهاز . BIA
- ونلاحظ أيضا في الرسم الرابع شكل ورقه الطباعه بعد استخدام جهاز . BMI
- وأيضا في الرسم الخامس يوضح . SGA
- ونلاحظ ان الرسم السادس يوضح ال (TSFL) قياس عضله الزراع اليسري (الشوكه) قبل وبعد التجربه
- ونلاحظ أيضا في الرسم السابع يوضح ال (TSFR) قياس عضله الزراع اليميني (الشوكه) قبل وبعد التجربه .
- كما نلاحظ في الرسم الثامن يوضح الكربوهيدرات قبل وبعد التجربه .
- ونلاحظ ان الرسم التاسع يوضح ال AST قبل وبعد التجربه .
- ونلاحظ أيضا في الرسم العاشر يوضح ال VFatL قبل وبعد التجربه .
- ونلاحظ أيضا في الرسم الحادي عشر يوضح ال RAFFM قبل وبعد التجربه .

