

## CONCLUSIONS AND RECOMMENDATIONS

Schistosomiasis has been a major public health problem in Egypt. It affects child development and adult productivity. Schistosomiasis continues to be a significant cause of morbidity and mortality.

With high prevalence rates for both HCV and schistosomiasis, it is inevitable that Egypt has a large number of humans with both diseases. Having both is more damaging to the liver and is associated with higher mortality rates than having just one.

The relationship between malnutrition and liver disease has been assuming greater significance due to the recognition that it is associated with adverse clinical outcomes. Liver disease patients who are malnourished not only have a higher morbidity, but also an increased mortality rate.

Bioelectrical Impedance Analysis (BIA) is a commonly used method for estimating body composition, and in particular body fat, the method has become popular owing to its ease of use, portability of the equipment and its relatively low cost compared to some of the other methods of body composition analysis.

This study showed that the two groups had malnutrition compared to the controls group. The degree of malnutrition was more severe in Group II that had mixed schistosomiasis and HCV infections.

Diet intake should be analyzed and revised for patients having liver disease. The proper diet composition regarding carbohydrates, fats, proteins and minerals should be calculated to each patient according to the degree of liver disease, biochemical data and body composition analysis.

## SUMMARY

Schistosomiasis has been a major public health problem in Egypt. It affects child development and adult productivity. Schistosomiasis continues to be a significant cause of morbidity and mortality. World Health Organization (WHO) considers schistosomiasis as the second only to malaria in socioeconomic importance worldwide and the third most frequent parasitic disease in public health importance.

Beginning in the 1950s and continuing until the 1980s, the Egyptian Ministry of Health conducted large campaigns using the standard treatment at that time, tartar emetic, as community-wide therapy, not properly sterilized and thus transferred traces of blood and blood-borne pathogens from human to human. As a result, this massive effort to control one health problem resulted in the creation of another, as HCV was spread through the intravenous injections. Indeed, this is estimated to be the largest known iatrogenic transmission of blood-borne infections in the history of the world.

With high prevalence rates for both HCV and schistosomiasis, it is inevitable that Egypt has a large number of humans with both diseases. Having both is more damaging to the liver and is associated with higher mortality rates than having just one.

Nutrition status is recognized as a predictor of morbidity and mortality in patients with advanced liver disease. The liver is an important regulator of metabolism, storage, synthesis, and absorption of nutrients. Accordingly, the severity of malnutrition increases with decreases in liver function. 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. Many patients have subtle changes such as fat-soluble vitamin deficiency, altered cell-mediated immune function, anemia from iron, folate or pyridoxine deficiency and minimal loss of muscle mass. Patients with end-stage liver disease have muscle wasting, decreased fat stores and cachexia.

Leptin, the adipocyte-derived protein product of the *ob* gene, is involved in appetite regulation and obesity through central effects at the hypothalamus. Leptin is related to amount of body fat. The importance of leptin in the regulation of energy balance, body composition, and food intake.

Bioelectrical Impedance Analysis (BIA) is a commonly used method for estimating body composition, and in particular body fat, the method has become popular owing to its ease of use, portability of the equipment and its relatively low cost compared to some of the other methods of body composition analysis. BIA is based on the assumption that an electric current is conducted well by water and electrolyte-containing parts of the body but poorly by fat and bone mass.

The present study aimed to evaluate the nutritional status of hepatitis C virus infected Patients in association with Schistosomal hepatic periportal fibrosis.

This study was carried out on 93 male adults subjects. Male adults subjects were chosen because they have the same fat percent. They were recruited from patients attending the Parasitology Department Clinic and the Hepatology Clinic of the Medical Research Institute, Alexandria University. A sample size of 31, 31 and 31 (total 93)

patients was taken. The study included three groups; Group I (31 patients with HCV), Group II (31 patients with mixed schistosomiasis and HCV) and Group III (31 healthy controls). Their age ranged from 20-65 years.

All subjects were subjected to the following then assigned to the corresponding group:

I-Clinical examination:

- 1- An information sheet was prepared for each patient.
- 2- Full history was obtained, including signs and symptoms of *Schistosoma mansoni* and HCV infections.
- 3- HCV infection was diagnosed by ELISA technique

II- Abdominal ultrasonography.

III- Parasitological examination:

- 1 - Stool examination by sedimentation and Kato-katz techniques.
- 2- Serology for Schistosomiasis using ELISA technique.

IV- Nutritional assessment:

- 1- Anthropometric measurements:
  - Age.
  - Height.
  - Weight.
  - Body Mass Index (BMI).
  - Waist and Hip circumference.

- 2- Body-Composition Measurement:

Body Fat (BF) will be measured using Bioelectrical Impedance Analysis. The BF loss monitor OMRON HBF-306 C (Omron health care, Illinois, USA) device was used.

V- Biochemical examination:

- Blood sample was withdrawn and the following investigations were performed:
- Complete Blood Count (CBC) and Hemoglobin level
- Liver Enzymes (ALT, AST).
- Serum Albumin.
- Lipid profile (Cholesterol, Triglycerides).
- Serum Leptin.

Results were tabulated and analyzed according to the appropriate bio-statistical methods using PASS 12 Program Professional License 2013 version 12.0.2.

This study showed that the two groups had malnutrition compared to the controls group. The degree of malnutrition was more severe in Group II that had mixed schistosomiasis and HCV infections.

The anthropometric measurements were more affected in Group II. The mean weight was 75 Kg in Group II, 79 Kg in Group I and 87 Kg in controls. The mean waist was 88.29 cm in Group II, 91.65 cm in Group I and 100.87 cm in controls. The mean waist-hip ratio was 0.82 in Group II, 0.87 in Group I and 0.90 in controls. The mean Fat percent in Group I was 17.56 %, in Group II was 14.95 % and 24.69 % in controls. The mean Body Mass Index in Group I was 26.81, in Group II was 25.94 and 29.21 in controls. This may be due to inadequate intake and associated malabsorption alters body composition and diminishes biological functions.

The present study discussed the clinical presentation of the studied groups. In Group I, 100 % of the patients had abdominal pain, 9.7 % had constipation, 48.8 % had hyperacidity, 22.6 % had regurgitation, and 6.6 % had piles. This may be due to anorexia that makes a significant contribution to malnutrition. Anorexia can be caused by physical symptoms of discomfort such as nausea, bloating, fatigue, and vomiting.

In Group II, 100 % of the patients had abdominal pain, 19.4 % had constipation, 29 % had hyperacidity, 19.4 % had regurgitation, and 3.2 % had bleeding per gum.

The present study showed differences in the complete blood picture between the studied groups. In Group I, the mean RBCs count was 4.70. In Group II, the mean RBCs count was 4.13. In Group I, the mean hemoglobin concentration was 12.23 gm/dl. In Group II, the mean hemoglobin concentration was 11.01 gm/dl. In Group I, the mean WBCs count was 6.52. In Group II, the mean WBCs count was 6.23. In Group I, the mean platelets count was 195.13. In Group II, the mean platelets count was 127.58. This may be due to reduced liver function; poor oral intake and complications of liver disease.

The present study showed that there were differences in the liver enzymes. In Group I, the mean ALT level was 38.19. In Group II, the mean ALT level was 44.48. In Group I, the mean AST level was 38.52. In Group II, the mean AST level was 45.71. This may be due to reduction of the ability of hepatocytes to store, synthesize, and break down glycogen.

The present study showed that there were differences in albumin level. In Group I, the mean albumin level level was 3.70 mg/dl. In Group II, the mean level was 3.12 mg/dl. This may be due to malabsorption, portosystemic shunting causes nutrients to bypass the liver, without metabolic processing.

This study showed that In Group I, the mean Cholesterol concentration was 143.94 mg/dl. In Group II, the mean Cholesterol concentration was 143.42 mg/dl. In Group I, the mean Triglycerides concentration was 118.13 mg/dl. In Group II, the mean Triglycerides concentration was 118.42 mg/dl. This may be due to altered rates of metabolism reflect a significant depletion in protein and fat.

The present study showed differences in Leptin levels, it was significantly higher in Group II. In Group I, the mean Leptin level was 5.54 ng/dl. In Group II, the mean Leptin level was 6.18 ng/dl. This may be due to levels of tumor necrosis factor (TNF) and leptin correlate with satiety and energy expenditure; patients with liver disease have increased serum levels of this cytokine.

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تقييم الحالة الغذائية لمرضى التهاب الكبد الوبائي سى بالتلازم مع تليف الكبد البلهارسى

## Assessment of the Nutritional Status of Hepatitis C Virus Infected Patients in Association with Schistosomal Hepatic Periportal Fibrosis.

Protocol of a thesis submitted to the  
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معهد البحوث الطبية  
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ايفاء جزئيا لشروط  
الحصول على درجة

**Ph.D. in Applied and Molecular Parasitology**

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## Background

Schistosomiasis has been a major public health problem in Egypt. It affects child development and adult productivity.<sup>(1)</sup> *Schistosoma mansoni*, prevalent in Lower Egypt, causes intestinal schistosomiasis with frequent ova passage in stool which become infrequent and scanty with subsequent disease progression due to submucosal fibrosis.<sup>(2)</sup> Controlling morbidity of schistosomiasis has been achieved through improved health education, mass antischistosomal chemotherapy, snail control within the activities of the primary health care system.<sup>(3)</sup>

Hepatitis C Virus (HCV) currently infects about 2% of the world's population, collectively, among all nations, the percentage positive for HCV ranges from 0.01% in Scandinavia to 3% in North Africa, with a single unique exception.<sup>(4)</sup> In 1992, when HCV antibody testing became widely available, the prevalence of HCV in Egypt was reported to be 10.8% among first-time blood donors.<sup>(5)</sup> Since this discovery, many prevalence estimates of HCV have been reported, mostly from rural communities located in the northern Nile Delta.<sup>(4)</sup> Two prospective studies estimating the incidence rate of new HCV cases suggested ongoing transmission in their respective communities.<sup>(6)</sup> For more than a decade, Egypt has been widely regarded as having an epidemic, with the highest recorded prevalence of HCV in the world. HCV is currently the most significant public health problem in Egypt.<sup>(4)</sup> The iatrogenic role of parenteral antischistosomal therapy campaigns to control endemic schistosomiasis, which ceased some decades ago, is a widely held hypothesis.<sup>(7)</sup>

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.<sup>(8)</sup> Many patients have subtle changes such as fat-soluble vitamin deficiency, altered cell-mediated immune function, anemia from iron, folate or pyridoxine deficiency and minimal loss of muscle mass.

Patients with end-stage liver disease have muscle wasting, decreased fat stores and cachexia.<sup>(9)</sup> Malabsorption also may be caused by several conditions: pancreatic insufficiency, cholestasis, portosystemic shunt, bile deficiency through inadequate absorption of long-chain fatty acids, metabolic alterations (high protein catabolism, reduced glucose homeostasis due to alterations of gluconeogenesis, low glycogen stores, proinflammatory cytokines such as Tumour Necrosis Factor alpha and interleukines).<sup>(10)</sup>

Leptin, a polypeptide hormone that is produced by adipocytes in proportion to their triglyceride content, links changes in body fat (BF) stores to adaptive responses in the central control of energy balance.<sup>(11)</sup> By binding to and activating the long form of its receptor in the brain, leptin decreases food intake while increasing energy expenditure. A major physiologic role of leptin is to respond to and defend against reductions of BF.<sup>(12)</sup> Leptin has been also implicated in many actions including liver fibrogenesis.<sup>(13)</sup> Serum leptin levels have been found higher in patients with chronic hepatitis C (CHC) and particular in those with more severe fibrosis or cirrhosis.<sup>(14)</sup> Leptin is an adipokine that contributes to the pathogenesis of liver steatosis.<sup>(15)</sup> In patients with CHC, higher serum leptin concentrations have been associated with the presence of steatosis.<sup>(16)</sup> Although no clear correlation has been observed between leptin concentrations and the extent of steatosis, it has been reported that high serum leptin concentrations correlated with more severe steatosis, lower viremia, and a lower antiviral response.<sup>(17)</sup>

Bioelectrical Impedance Analysis (BIA) is a commonly used method for estimating body composition, and in particular body fat. Since the advent of the first commercially available devices in the mid-1980s the method has become popular owing to its ease of use, portability of the equipment and its relatively low cost compared to some of the other methods of body composition analysis.<sup>(18)</sup> BIA is based on the assumption that an electric

current is conducted well by water and electrolyte-containing parts of the body but poorly by fat and bone mass. A fixed, low-voltage, high-frequency alternating current introduced into the human body or tissues conducted almost completely through the fluid compartment of the fat-free mass.<sup>(19)</sup>

### **Aim of the Work**

The aim of the work is to assess the nutritional status of Hepatitis C Virus infected patients in association with schistosomal hepatic periportal fibrosis.

## Subjects and Methods

### Subjects:

This study will be carried out on 93 male adults subjects. They will be recruited from patients attending the Parasitology Department Clinic and the Hepatology Clinic of the Medical Research Institute, Alexandria University.

All participants will be asked to freely volunteer to the study and informed written consent will be gathered prior to their inclusion in the study protocol, according to the ethical guidelines of the Medical Research Institute, Alexandria University (Appendix I, Informed Witten Consent for Patient Participation in a Clinical Research, 2001).

### Sample Size Calculation:

A sample size of 31, 31 and 31 (total 93) produces a power of 80% to detect difference between the mean Body Fat (BF) in HCV infected patients ( $15\pm 10$ ) and mean BF in HCV with schistosomiasis ( $12\pm 7$ ) and controls ( $20\pm 3$ ), at a level of significance of 0.05, using one way ANOVA test.

The study will include three groups:

- Group I:** 31 patients having HCV.
- Group II:** 31 patients having mixed schistosomiasis and HCV.
- Group III:** 31 healthy controls.

### Inclusion criteria:

- Chronic HCV infected liver disease.
- Adults
- Males

### Exclusion criteria:

- Pre-existent malnutrition
- Hepatocellular carcinoma

- Active alcohol abuse
- Co-infection with HBV or HIV
- Chronic renal failure (GFR < 50 ml/min)
- Females
- Children

**Methods:**

All subjects will be subjected to the following then assigned to the corresponding group:

**I- Clinical examination:**

- 1- An information sheet will be prepared for each patient.
- 2- Full history will be obtained, including signs and symptoms of *Schistosoma mansoni* and HCV infections.
- 3- HCV infection will be diagnosed by ELISA technique.<sup>(20)</sup>

**II- Abdominal ultrasonography to all subjects:**

Abdominal ultrasonography will be performed to detect the degree of fibrosis according to the WHO scoring system.<sup>(21)</sup>

**III- Parasitological examination:**

- 1- Stool examination by sedimentation and Kato-katz techniques.<sup>(22)</sup>
- 2- Serology for Schistosomiasis using ELISA technique.<sup>(23)</sup>

**IV- Nutritional assessment:**

- 1- Anthropometric measurements:
  - Age.
  - Sex.
  - Height.
  - Weight.

- Body Mass Index (BMI).
- Waist and Hip circumference.

## 2- Body-Composition Measurement:

Body Fat (BF) will be measured using Bioelectrical Impedance Analysis.

The BF loss monitor OMRON HBF-306 C (Omron health care, Illinois,USA) device will be used. Omron BF loss monitor may underestimate BF by about 3 % in comparison with measurement taken by calipers, as reported by the manufacturer.<sup>(24)</sup>

## V- Biochemical examination:

Blood sample will be withdrawn and the following investigations will be performed:

- Complete Blood Count (CBC) and Hemoglobin level <sup>(25)</sup>
- Liver Enzymes (ALT, AST).<sup>(26)</sup>
- Serum Albumin.<sup>(26)</sup>
- Lipid profile (Cholesterol, Triglycerides).<sup>(26)</sup>
- Serum Leptin.<sup>(27)</sup>

## **Analysis of Results**

Results will be tabulated and analyzed according to the appropriate bio-statistical methods using PASS 12 Program Professional License 2013 version 12.0.2.

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# تقييم الحالة الغذائية لمرضى التهاب الكبد الوبائي سى بالتلازم مع تليف الكبد البلهارسى

رسالة

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إيفاء جزئيا لشروط الحصول على درجة

الدكتوراه

فى

الطفيليات التطبيقية و الجزئية

مقدمة من

باسم عادل الهابط

بكالوريوس الطب و الجراحة- جامعة الإسكندرية، ١٩٩٦  
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للحصول على درجة

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## الملخص العربي

تمثل الإصابة بطفيل البلهارسيا مشكلة صحية عامة عظيمة في مصر، حيث أنها تؤثر على نمو الأطفال والإنتاج في البالغين، وتظل سببا للمرض والموت.

وتعتبر منظمة الصحة العالمية الإصابة بالبلهارسيا في المرتبة الثانية بعد الملاريا في الأهمية الاقتصادية والاجتماعية على مستوى العالم، والمرتبة الثالثة في الأهمية في الأمراض الطفيلية الأكثر انتشارا.

ومع بداية الخمسينات وحتى الثمانينات من القرن الماضي أقامت وزارة الصحة المصرية الكثير من تطبيقات العلاج والتي بدأت بالعلاج السائد حينها وهي حقن الطارطار الوريدية، ومع الاستعمال الشائع في المجتمع حينها للمحاقن الغير معقمة جيدا فإن بقايا دم المريض بها قد ساهم في انتشار مسببات الأمراض التي تنتقل عن طريق الدم.

وقد ساهم ذلك في انتشار فيروسات الالتهاب الكبدى الوبائى (سى) عن طريق ذلك الحقن الوريدي والذي اعتبر الباحثون أن انتشار هذا الفيروس من أكثر المشاكل الصحية التي زادت انتقالها نتيجة خطأ التعامل الطبي. ولهذا المعدل العالي في الانتشار لكليهما كان من المحتم في مصر أن يوجد في مصر معدلات إصابة عالية للبلهارسيا وفيروس الالتهاب الكبدى (سى)، والذي يعطى أثر كبيرا على مرض الكبد وتدمير خلاياه.

ان تقدير الحالة الغذائية يعتبر من مؤشرات المرض وتوقع الوفاة في المرضى المصابين بأمراض كبدية متقدمة. والمعروف أن الكبد هو المنظم الهام للتمثيل الغذائى وتخزين الفائض وتصنيع وامتصاص المواد الغذائية.

وبالتالى فإن شدة حالة سوء التغذية تزداد مع نقص وظائف الكبد. وتتراوح معدلات سوء التغذية في أمراض الكبد من ٢٠% في الحالات التي يقوم الكبد بوظيفته بالكاد إلى أكثر من ٨٠% من المرضى التي يظهر فيها بدايات الفشل الكبدى.

وتظهر علامات سوء التغذية بداية في نقص الفيتامينات الذائبة في الدهون ومتغيرات الاستجابة المناعية الخلوية وفقر الدم ونقص الفولات والبيروكسين ونقص الكتلة العضلية للجسم، أما المرضى في حالة الكبد عند فشل وظيفته فتظهر علامات ضمور العضلات ونقص الدهون المخترنة والهزال الشديد.

يعتبر الباحثون أن مادة اللبتين بروتين مشتق من نسيج الدهون المخترنة مادة محفزة للشهية ولها علاقة بالسمنة من خلال التأثير المركزى على مراكز المخ وتعلق معدلاته بالدم بكمية دهون الجسم. وتكون مهامه في توازن الطاقة وتركيب الجسم ومعدلات تناول الغذاء.

من الطرق الشائع استعمالها لتقييم مكونات الجسم وبخاصة الدهون جهاز تحليل المقاومة الكهروحيوية وذلك لسهولة ويسر الاستعمال وكونه متنقلا وقلة التكلفة بالمقارنة بالطرق الأخرى، ويعتمد الجهاز على تمرير تيار كهربى من خلال سوائل الجسم والتي تحتوى على مواد تختلف في مدى التوصيل الكهربى ويقل ذلك في الدهون والكتلة العظمية.

استهدفت الدراسة الحالية تقدير وتقييم الحالة الغذائية للمرضى المصابين بفيروس (سى) والبلهارسيا وتليف الكبد.

وقد أجريت على ٩٣ من الذكور البالغين وتم اختيارهم بحيث يكونون متقاربين في نسب دهون الجسم وذلك من المرضى المترددين على العيادة الخارجية لمعهد البحوث الطبية لأمراض الكبد والأمراض المتوطنة. وتم اختبار المجموعة و تقسيمها على ثلاث مجموعات كل واحدة تحتوى على ٣١ حالة:

مجموعة (١) مرضى الالتهاب الكبدى (سى) ومجموعة (٢) الإصابة المزوجة بفيروس (سى) والبلهارسيا ومجموعة (٣) كمجموعة قياسية، وتراوحت أعمارهم بين ٢٠، ٦٥ عاما.

- وتم القيام بعمل الآتى لكل الأفراد، كل حسب مجموعته:

- الفحص الأكلينكى.
- ورقة معلومات مرفقة لكل حالة.
- تاريخ كامل للمرض بكل علاماته وأعراضه لكل من الإصابتين.
- تشخيص الإصابة بفيروس الالتهاب الكبدى بطريقة الأليزا
- عمل فحص موجات فوق صوتية لأعضاء البطن.

- التشخيص الطفيلي بواسطة: فحص عينات البراز بكل من طريقة الترسيب والكاتو و فحص مصل الدم للأجسام المضادة للبلهارسيا بطريقة الأليزا.
- تقييم الحالة الغذائية من خلال:
- قياسات الطول والوزن ومعدل كتلة الجسم
- مقارنة ذلك بالعمر والجنس لكل فئة
- قياسات كل من محيط الجسم عند الخصر ومفصل الفخذ
- قياسات تركيب الجسم: باستعمال جهاز التحليل الكهروحيوى لتقدير دهون الجسم.
- قياسات كيميائية: من خلال عينات الدم المأخوذة من المرضى، تحت الفحوص الآتية:
- صورة دم كامل. قياسات إنزيمات المحولات الأمينية.
- نسبة الالبومين: صورة دهون كاملة (كولسترول ودهون ثلاثية).
- نسبة بروتين الليبتين.

### النتائج:

بعد جمع النتائج وتحليلها إحصائياً، أظهرت الدراسة الآتى:

مقارنة مجموعة المرضى للإصابة المنفردة أو المزدوجة وجدا أنهما يعانيان من سوء التغذية مقارنة بالمجموعة القياسية ولكنها أكثر سوءاً في مجموعة الإصابة المزدوجة (بالبلهارسيا والالتهاب الكبدى الوبائى).

أضح مدى تأثير القياسات الجسمية فى المجموعة الثانية (الإصابة المزدوجة) حيث كان الوزن فى حينها كان حولى ٧٥ كجم و ٧٩ كجم فى المجموعة الأولى مقارنة بالمجموعة القياسية ٧٨ كجم، بينما كان محيط الخصر حوالى ٨٨سم فى المجموعة الثانية وقرب ٩٢سم فى الأولى بينما تعدى ١٠٠سم فى المجموعة القياسية. وذلك أيضا فى محيط الحوض وتراوح معدل دهون الجسم فى المجموعة الأولى حول ١٧% والثانية حوالى ١٥% بينما كانت حولى ٢٥% فى المجموعة القياسية.

و كان متوسط معدل كتلة الجسم فى المجموعة (١) حوالى ٢٧ تقريبا بينما كان فى المجموعة (٢) حوالى ٢٦ و فى المجموعة القياسية ٢٩ كجم/م<sup>٢</sup>

و ربما يوعز ذلك لنقص تناول الغذاء و ارتباط ذلك بعدم امتصاص نواتج الهضم مما قد يؤدي الى تغير تركيب الجسم و اخلال الوظائف الحيوية .

وأظهرت الدراسة الصورة الإكلينيكية فى المجموعة الأولى أن المرضى جميعهم يعانون من آلام بالبطن، ٧٩% من الإمساك وحوالى ٥٠% من شعور بالحموضة، ٢٢% من الارتجاع المريئى، ٦% من البواسير.

و قد يرجع ذلك الى نقص الشهية المصاحب بالغثيان و الشعور بالامتلاء و الارهاق و القيئ .

أما المجموعة الثانية فكانوا يعانون أيضا من آلام بالبطن، ١٩% من الإمساك، ٢٩% من الحموضة، ١٩% من الارتجاع، ٣% من نزيف بالثثة.

وبمناظرة صورة الدم كانت المقارنة كالأتى:

عدد خلايا الحمراء فى المجموعة الأولى حول ٤.٧ مليون والثانية ٤.١ مليون، ومتوسط الهيموجلوبين فى المجموعة الأولى ١٢.٢ جم/دل والثانية ١١.١ جم/دل. وعدد خلايا البيضاء بمتوسط ٦.٥٠٠ فى المجموعة الأولى بينما كان فى الثانية ٦.٢٣٠ وعدد صفائح الدم فى المجموعة الأولى ١٩٥ ألف والثانية حولى ٢٧ ألف.

وقد أظهرت الدراسة الحالية الخلاف الواضح فى المحولات الأمينية للألنين حيث كانت حوالى ٤٨ فى المجموعة الأولى، و ٤٤ فى الثانية، أما للاسبرتات فكانت فى الأولى ٣٨ والثانية ٤٥.

و قد تشير النتائج الى انخفاض قدرة خلايا الكبد على تخزين و صناعة و تكسير حبيبات الجليكوجين فى الكبد .

كذلك ظهر تغير فى نسب الالبومين فكان فى المجموعة الأولى ٣.٧ مجم/دل والثانية ٣.١ مجم/دل.

و قد يرجع ذلك الى سوء الامتصاص و تمدد شبكات الاتصال الوريدى البابى التى تسبب تجاوز مرور العناصر الغذائية على الكبد بدون حدوث عمليات التمثيل الغذائية .

أما فى مستوى الدهون فى مصر المرضى فظهر أن الكولسترول فى المجموعة الأولى حوالى ١٤٤ مجم/دل والثانية ١٤٣ مجم/دل، والدهون الثلاثية فكانت فى المجموعة الأولى ١١٨ مجم/دل والثانية ١١٨.

و قد يوعز ذلك لتغير معدلات الهدم و البناء و التى تؤدى الى نقص واضح فى البروتين و الدهون .

وأخيرا بمناظرة نسب مادة اللبتين فكانت أعلى فى المجموعة الثانية (٦.١٨ ميكرو جم/دل) عنها فى المجموعة الأولى (٤.٥٤ ميكرو جم/دل).

ربما يشير الارتفاع فى مادة اللبتين الى الاختلاف فى مستويات المواد الكيميائية الوسيطة بين الخلايا (TNF) و كذلك علاقته بالشهية و معدلات حرق الطاقة . حيث ان مرضى الكبد عادة ما تكون وسائط المناعة بين الخلايا تكون مرتفعة .