Risk factors for malnutrition in patients undergoing gastroenterological and hernia surgery: an analysis of 374 patients

M. Isabel T. D. Correia, M. D.* Waleska T. Caiaffa, M. D.** Alcino Lázaro da Silva, M. D.*** Dan L. Waitzberg, M. D.****

* Hospital Associação dos Amigos do Mário Penna, Belo Horizonte, Minas Gerais; Medical School; ** Department of Social Preventive Medicine, Federal University of Minas Gerais Medical School; *** Department of Surgery, Federal University of Minas Gerais Medical School; **** Department of Surgery, University of São Paulo Medical School, Brasil

Abstract

Objective: The aim of this study was to assess the nutritional status of 374 surgical patients with gastrointestinal disease and hernias of the abdominal wall; to identify risk factors associated with a poorer nutritional status in this group of patients and to assess awareness of the patient’s nutritional status by medical teams.

Summary Background Data: Malnutrition is prevalent among surgical patients and is associated with higher surgical complication rates and mortality. The major causes of poor nutritional status are related to the underlying disease, socio-economic factors, age, and length of hospitalization. Despite its high prevalence, medical teams often overlook malnutrition, and screening of these patients is not routine. It is of utmost importance to identify patients at risk for malnutrition in order to prevent related complications.

Methods: The 374 patients evaluated in this study were a subgroup of a larger multicenter, cross-sectional, randomized study that was carried out in 1996. Nutritional status was assessed by using Subjective Global Assessment.

Results: Malnutrition was present in 55% of the patients, with 19% of the patients severely malnourished. The presence of cancer, infection, age over 60 years, upper gastrointestinal disease, and longer length of hospital stay all negatively influenced nutritional status. Despite the high prevalence of malnutrition, the medical teams only assessed the nutritional status of a few patients.

Conclusion: Malnutrition was highly prevalent in this setting of patients. Therefore, patients with the risk factors above presented should routinely undergo nutritional screening and/or assessment in order to be able to early diagnose or prevent malnutrition and its correlated morbidity and mortality.

(Nutr Hosp 2001, 16:59-64)

Key words: Malnutrition. Surgery.

Resumen

Objetivo: La finalidad de este estudio fue evaluar el estado de nutrición de 374 pacientes operados de enfermedades digestivas y hernias de la pared abdominal, identificar los factores de riesgo asociados con un deficiente estado de nutrición en este grupo de enfermos y examinar si los equipos de médicos son conscientes del estado de nutrición de sus pacientes.

Información básica resumida: La desnutrición es prevalente entre los pacientes operados y se asocia con una frecuencia mayor de complicaciones quirúrgicas y mortalidad. Las causas fundamentales del deficiente estado de nutrición están relacionadas con la enfermedad subyacente, factores socioeconómicos, la edad y la duración de la hospitalización. Pese a su gran prevalencia, los equipos de médicos suelen pasar por alto la desnutrición y no identifican sistemáticamente a estos pacientes. Es de suma importancia identificar a los enfermos con riesgo de desnutrición para prevenir las complicaciones relacionadas.

Métodos: Los 374 pacientes evaluados en este estudio constituían un subgrupo incluido en un estudio aleatorizado, transversal y multicéntrico, de mayores dimensiones, realizado en 1996. Para evaluar el estado de nutrición se utilizó la Evaluación Global Subjetiva.

Resultados: El 55% de los pacientes estaban desnutridos, en el 19% de los casos en un grado muy importante. La presencia de cáncer o infección, una edad mayor de 60 años, la existencia de enfermedades de la porción superior del aparato digestivo y una estancia hospitalaria prolongada influyeron negativamente en el estado de nutrición. Pese a la gran prevalencia de la desnutrición, los equipos de médicos sólo evaluaron el estado de nutrición de algunos pacientes.

Conclusión: La desnutrición fue muy prevalente en esta población de pacientes. Por tanto, hay que comprobar sistemáticamente el estado de nutrición de los enfermos con los factores de riesgo mencionados con objeto de diagnosticar con prontitud o prevenir la desnutrición y su morbilidad y mortalidad asociadas.

(Nutr Hosp 2001, 16:59-64)

Palabras clave: Cirugía. Desnutrición.
**Introduction**

Hospital malnutrition contributes to high morbidity and mortality rates\(^{1-4}\). According to published literature, 30% to 40% of the patients in general hospitals demonstrate some degree of malnutrition\(^{5-9}\). In Brazil, hospital malnutrition has been described as particularly high, especially in gastrointestinal surgical patients\(^{10-12}\). Malnutrition in surgical patients is a consequence of several different factors, from socio-economical issues to those related to the disease itself\(^{13-15}\). The more severe the disease, the greater the risk of malnutrition. These patients are in a state of hypermetabolism with increased nutritional requirements, but usually have insufficient intake. In patients with gastrointestinal disease, the anatomical localization of the disease might also interfere with eating and swallowing, digestion and absorption of food\(^{16-18}\).

The interest in nutritional status of hospitalized patients is due to complications related to malnutrition, such as increased number of infections, poor wound healing, longer hospitalisation, and mortality\(^{19-20}\). These complications increase hospital costs, as well as costs related to rehabilitation and return of the patient to normal activities\(^{21}\).

It is of utmost importance to nutritionally assess surgical patients in order to early identify patients at risk of malnutrition or, already, in a poor nutritional status, so that they can be treated early in the course of their hospitalisation, thus avoiding the nutritional related complications.

**Patients and methods**

In this study, 374 patients who were hospitalized for gastrointestinal or hernia surgery were analyzed. This group of patients was taken from a multicenter, cross sectional study (IBRANUTRI - Brazilian Survey on Hospital Nutritional Assessment)\(^{22}\), carried out in 1996 by the Brazilian Society of Parenteral and Enteral Nutrition. The study design was reported elsewhere\(^{23}\). The nutritional status was obtained by using Subjective Global Assessment (SGA) as described by Detsky\(^{24}\). Adult patients of both sexes (age > 18) admitted to the study hospitals were eligible for the study. Pregnant or post-partum women, as well as coma and/or unconscious patients who had no family members to answer the SGA were excluded.

The data was analyzed using the statistical software package Epi-info 6.0 and SPSS, version 6.1.2. The analyses performed were (1) frequency distribution of all interest variables to be analyzed, including the prevalence of malnutrition, (2) chi-square test for the association of malnutrition with various variables (cancer, infection, length of hospital stay and age); (3) univariate analysis with the odds ratio test to measure the power of association of those variables considered risk factors for malnutrition, and (4) multivariate analysis (multiple logistic regression). A p-value of < 0.05 was considered significant.

**Results**

The average length of hospital stay in these patients was 51.6 years old (range: 19-99), and 51.6% (193) were men. The majority were white (55.6%). The admission diagnosis is shown in table I.

Malnutrition, according to SGA, was found in 55% of the patients. A total of 19% were diagnosed as being severely malnourished.

There were 139 patients with cancer. The prevalence of malnutrition was significantly higher in patients with cancer compared to those without cancer (83.5% vs. 38.3%, p < 0.05). Of the 149 patients with infection, 61.7% were malnourished. Age greater than 60 years was also related to a higher rate of malnutrition (64.4% vs. 50%) (see table II). In patients whose disease was located in the upper gastrointestinal tract (oropharynx to duodenum), 76.8% were malnourished, and in those with disease in the lower tract (jejunum to the anus), 60.2% were malnourished. Biliary and pancreatic diseases were associated with malnutrition in 51.5% of patients. In those without anatomically specified disease, 66.6% were malnourished. Patients with abdominal wall hernias were unlikely to be malnourished (17%) (table III).

Using univariate analysis, the odds ratio (OR) of malnutrition in patients with upper gastrointestinal disease was 16.2. This means that there was a 16-fold greater chance of malnutrition in patients with disease in the upper gastrointestinal tract. In cancer patients, the OR was 8.13, in patients with infection or age greater than 60, the OR was 1.57 and 1.81 (p < 0.05), respectively (tables II and III).

**Table I**

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal trauma</td>
<td>3</td>
<td>0.8</td>
</tr>
<tr>
<td>Acute abdomen</td>
<td>9</td>
<td>2.4</td>
</tr>
<tr>
<td>Acute appendicitis</td>
<td>20</td>
<td>5.3</td>
</tr>
<tr>
<td>Acute cholecystitis</td>
<td>16</td>
<td>4.3</td>
</tr>
<tr>
<td>Acute pancreatitis</td>
<td>10</td>
<td>2.7</td>
</tr>
<tr>
<td>Colon and rectum cancer</td>
<td>25</td>
<td>6.7</td>
</tr>
<tr>
<td>Common bile duct stone</td>
<td>5</td>
<td>1.3</td>
</tr>
<tr>
<td>Esophageal cancer</td>
<td>13</td>
<td>3.5</td>
</tr>
<tr>
<td>Gall bladder, common bile duct</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hepatic cancer</td>
<td>24</td>
<td>6.4</td>
</tr>
<tr>
<td>Gastric cancer</td>
<td>28</td>
<td>7.5</td>
</tr>
<tr>
<td>Gastroduodenal ulcerations</td>
<td>8</td>
<td>2.1</td>
</tr>
<tr>
<td>Groin hernia</td>
<td>37</td>
<td>9.9</td>
</tr>
<tr>
<td>Intestinal obstruction</td>
<td>12</td>
<td>3.2</td>
</tr>
<tr>
<td>Intra-abdominal abscesses</td>
<td>7</td>
<td>1.9</td>
</tr>
<tr>
<td>Non complicated gallbladder stones</td>
<td>61</td>
<td>16.3</td>
</tr>
<tr>
<td>Oral cancer</td>
<td>6</td>
<td>1.6</td>
</tr>
<tr>
<td>Other abdominal wall hernias</td>
<td>17</td>
<td>4.5</td>
</tr>
<tr>
<td>Other diagnosis</td>
<td>65</td>
<td>17.8</td>
</tr>
<tr>
<td>Perianal diseases</td>
<td>8</td>
<td>2.1</td>
</tr>
</tbody>
</table>
prior to SGA (from the day they were admitted to the
day they were seen by the researchers) was 11.4 days
(median of 6 days). However, malnourished patients
had an average of 15.9 days (median of 9 days) and
nourished patients were in the hospital for an average of
5.9 days (median of 3 days), p < 0.05. In general, the
longer the hospitalization, the greater the malnutrition.
Malnutrition was present in 37.1% of the patients exa-
mined 48 hours after admission, in 49.1% of those seen
between day 3-7, and in 57.7% of those seen between
day 8-14. Over 80% of the patients staying in the hospi-
tal for more than 15 days were malnourished (figure 1).

Variables that exhibited levels of statistical signifi-
cance in the univariate analysis were entered into a
multivariate logistic regression analysis. This de-
monstrated the importance of all variables as being
significant risk factors for malnutrition in this group
of patients (table IV).

Despite the high prevalence of malnutrition in this
setting, the responsible medical teams had rarely re-
ported in the charts any reference to the nutritional
status of the patients. Most of them (72.5%) did not
have any reference to their nutritional status in the
hospital record. Only 16.6% had been weighed at ad-
mission and 19.2% had their usual body weight men-
tioned in the records, despite the fact that in 87.4% of
the cases scales available within a 50-meter distance
of the patients’ beds.

Discussion

Malnutrition in surgical patients is still highly pre-
valent and represents a serious risk for the develop-
ment of complications, according to the literature.

Table II
Prevalence of malnutrition versus age, presence of cancer and infection

<table>
<thead>
<tr>
<th></th>
<th>Malnourished</th>
<th>Nourished</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &gt; 60 years</td>
<td>85 (64.4%)</td>
<td>47 (35.6%)</td>
</tr>
<tr>
<td>Age &lt; 60 years</td>
<td>121 (50.0%)</td>
<td>121 (50.0)</td>
</tr>
<tr>
<td>Cancer</td>
<td>116 (83.5%)</td>
<td>23 (16.6%)</td>
</tr>
<tr>
<td>Without cancer</td>
<td>90 (38.3%)</td>
<td>145 (61.7)</td>
</tr>
<tr>
<td>Infection</td>
<td>92 (61.7%)</td>
<td>57 (38.3%)</td>
</tr>
<tr>
<td>Without infection</td>
<td>114 (50.7%)</td>
<td>111 (49.3)</td>
</tr>
</tbody>
</table>

* p < 0.05.

Table III
Prevalence of malnutrition versus anatomical localization of the disease

<table>
<thead>
<tr>
<th>Localization</th>
<th>Malnourished</th>
<th>Nourished</th>
<th>OR</th>
<th>IC 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal wall hernia</td>
<td>9 (17.0%)</td>
<td>44 (83.0%)</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Biliary and pancreatic disease</td>
<td>69 (51.5%)</td>
<td>65 (48.5%)</td>
<td>5.19*</td>
<td>2.22-12.45</td>
</tr>
<tr>
<td>Lower gastrointestinal tract</td>
<td>47 (60.2%)</td>
<td>31 (39.8%)</td>
<td>7.41*</td>
<td>2.96-19.03</td>
</tr>
<tr>
<td>Upper gastrointestinal tract</td>
<td>63 (76.8%)</td>
<td>19 (23.3%)</td>
<td>16.21*</td>
<td>6.22-43.54</td>
</tr>
<tr>
<td>Not defined</td>
<td>18 (66.6%)</td>
<td>9 (33.4%)</td>
<td>9.78*</td>
<td>2.97-33.57</td>
</tr>
</tbody>
</table>

* p < 0.01.

Discussion

Malnutrition in surgical patients is still highly pre-
valent and represents a serious risk for the develop-
ment of complications, according to the literature.

Table IV
Multiple logistical regression of variables considered risk factors for malnutrition in univariate analysis

<table>
<thead>
<tr>
<th></th>
<th>Adjusted OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.8*</td>
</tr>
<tr>
<td>Cancer</td>
<td>5.7*</td>
</tr>
<tr>
<td>Infection</td>
<td>2.1*</td>
</tr>
<tr>
<td>LOS</td>
<td>2.8*</td>
</tr>
</tbody>
</table>

* p < 0.05.
Mortality is also influenced by poor nutritional status[21]. Subsequently, hospital and social costs are also increased[22]. Levine et al demonstrated that 45% of the patients diagnosed as being malnourished at admission stayed in the hospital longer and had an increased number of complications[23]. Reilly et al demonstrated that malnourished patients had more severe complications compared to patients with good nutritional status[24]. Patients undergoing foot amputation who were malnourished had a 20% healing rate compared to an 80% healing rate in those with good nutritional status[25]. The loss of 15-20% of normal body weight is associated with concomitant and significant loss of protein stores. When 20% of the protein stores are lost, most of the physiological functions become affected. This leads to higher complication rates and mortality[26].

The best method for conducting nutritional assessment remains controversial. In the present study we assessed nutritional status using SGA as described by Detsky et al[27] who reported a level of concordance above 80% among investigators. In the pilot study of IBRANUTRI[28] we obtained a level of concordance, among different investigators, of 89%. It is important to stress that in the pilot study the investigators who performed nutritional assessment were not-nutrition experts (nurses, nutrition students and medical residents) and had no previous knowledge of performing SGA. They were specifically trained on a two day session by one of the authors (MITDC) to perform SGA. Based on this result, SGA was deemed suitable for use by the many multidisciplinary teams in different parts of Brazil. Training of each team resulted in inter-team standardization. Throughout the study period, all nutritional assessment protocols were checked by the local coordinator and by one of the authors (MITDC) before entering the data base in order to verify discrepancies between the data collected and the nutritional diagnosis given. Based on this result, SGA was deemed suitable for use by the many multidisciplinary teams in different parts of Brazil. Training of each team resulted in inter-team standardization. Throughout the study period, all nutritional assessment protocols were checked by the local coordinator and by one of the authors (MITDC) before entering the data base in order to verify discrepancies between the data collected and the nutritional diagnosis given. Although SGA was described to assess nutritional status within 48 hours of admission, we used this tool after having trained all the interviewers to consider the chances on body weight gastrointestinal symptoms, eating habits and functional capacity prior to hospital admission. SGA is a non-invasive, inexpensive, sensitive and specific assessment tool[29]. Anthropometric measurements, such as skin-fold thickness, mid-arm circumferences and BMI may be used to determine body composition, but only indirectly assesses nutritional status. Parameters such as albumin and pre-albumin may also suffer interference from disease states other than malnutrition[30].

Malnutrition rates in patients with gastrointestinal diseases have been reported to be as high as 50%[1, 8, 21]. In this study, 55% of patients were malnourished, with 19% of total patients severely malnourished. However, when analyzing the patients according to different diagnoses, to age, and to length of hospitalization, varying degrees of malnutrition were present. The nutritional status of hospitalized patients is influenced by different variables[31], including admission diagnosis. This is especially true in patients diagnosed with diseases relating to the gastrointestinal tract because these diseases interfere with the metabolic response of the patients, and in most cases, increase the metabolic rate[32]. In addition, these patients frequently present with nausea, vomiting, diarrhea, and dysphagia, all of which decrease intake, digestion, and absorption of food[33]. This study showed that patients with cancer had the highest rate of malnutrition (83.5% vs. 38.3% of those without cancer). Malnourished patients were 1.5 times more likely to have an infection (OR = 1.57), and a 16-fold greater chance of having upper gastrointestinal tract disease (OR = 16.21).

Age is another variable that influences the nutritional status of patients[34]. Older patients, aside from their disease, present with other factors that interfere in the nutritional status, such as decreased production of gastrointestinal secretions, damaged or lack of teeth, social isolation, and psychological derangements (depression)[35]. In this study, 64.4% of patients older than 60 years were malnourished compared to 50% of patients who were younger than 60 (p < 0.05).

Malnutrition is also related to the length of hospitalization[36]. The longer the patient remains in the hospital the greater the chance of poor nutritional status. This is most often related to the severity of the patient’s disease, and is due to increased metabolic demands. These patients may suffer from depression, or may dislike the hospital food. Most often, the patients remain on liquid diets or intravenous fluids for prolonged periods during testing or treatment, resulting in starvation. This study showed that 81.1% of the patients who were in the hospital for more than 15 days were malnourished.

Higher complication rates and mortality cannot be attributed to malnutrition alone. Surgery-related factors, such as type and extent of the surgery, blood transfusion, experience of the surgeon, and type of anesthesia also play an important role on postoperative outcome[27]–[34]. During the Maastricht trial[34], these factors were analyzed using a multiple logistic regression model with the complication rate as the dependent variable. The results showed that perioperative...
blood loss was the most important factor associated with the development of complications. However, if a complication did occur then the percentage of ideal body weight and the duration of operation were associated with the severity of the complication, again stressing the importance of the nutritional status on outcome. The influence of other variables on postoperative complications might make it difficult to demonstrate a statistically significant relationship between malnutrition and surgical complications and mortality, unless a large number of patients are studied. Nevertheless, the previously reported results do not negate the importance of malnutrition on the patient’s outcome and the need for nutritional therapy when a poor nutritional status is present or risk factors are identified. It is important to remember that healthy human beings, without any trauma factor, can only survive in a fasting state for about 6 weeks. Due to everything mentioned above, it is of utmost importance to assess the nutritional status of surgical patients.

Unfortunately, the medical teams do not seem to recognize malnutrition as a serious problem. McWhiter & Pennington showed that out of 200 hundred malnourished patients only 50% had any information on the nutritional status in the medical records. Most of the patients (72.5%) in this study did not have any reference to their nutritional status in the hospital record. Only 16.6% had been weighed at admission and 19.2% had their usual body weight mentioned in the records, despite the fact that in 87.4% of the cases scales available within a 50-meter distance of the patients’ beds.

In conclusion, malnutrition is still highly prevalent among hospitalized surgical patients and not recognized by medical teams, as presented by us. Accordinly to the literature, one is of the factors associated with a poor postoperative outcome. Therefore, surgical patients with risk factors for a poor nutritional status, such as those identified by us, like cancer, infection, disease located in the upper gastrointestinal tract, age over 60, or who have been in the hospital for longer periods should undergo nutritional assessment and follow up. If needed, nutritional therapy should be prescribed immediately. In addition, caregivers should be orientated about the importance of good nutritional status as a positive factor influencing morbidity and mortality and therefore should be trained to identify malnourished patients or those at risk of malnutrition.

Acknowledgements

We would like to acknowledge the regional coordinators and their research teams, including: Dr. Paulo Boente, Salvador, Bahia; Dr. Hélio Chagas Ferro, Maceio, Alagoas; Dr. Lúcio Flávio Alencar, Recife, Pernambuco; Dr. Silvio Dantas, Natal, Rio Grande do Norte; Dr. Paulo Roberto Leitão Vasconcelos, Fortaleza, Ceará; Dr. Jorge Alberto Landbeck Ohana, Belém, Pará; Dr. Aluídio Trindade Filho, Brasília, Distrito Federal; Dr. Álvaro Armando C. de Morais, Vitória, Espírito Santo; Dr. Ricardo Rosenfeld, Rio de Janeiro, Rio de Janeiro; Dr. Edson Lameu, Rio de Janeiro, Rio de Janeiro; Dr. Eduardo E. M. Rocha, Rio de Janeiro, Rio de Janeiro; Nut. Luciana Z. Coppini, S. Paulo, S. Paulo, Dr. Antônio Carlos Campos, Curitiba, Paraná, Nut. Bernadette Weber, Porto Alegre, Rio Grande do Sul, Dra. Maria Cristina Silva, Pelotas, Rio Grande do Sul; and Dr. Mauro Kleber Souza e Silva, Belo Horizonte, Minas Gerais.

We would also like to acknowledge Abbott International for the educational grant that permitted the execution of this study.

References