Prevalence of malnutrition and its risk factors in stroke patients residing in an infirmary
Chai J, Chu F C S, Chow T W, Shum N C

ABSTRACT
Introduction: The aim of this study was to investigate the prevalence of malnutrition, and its associated risk factors, in stroke patients residing in an infirmary in Hong Kong.

Methods: A cross-sectional retrospective study of 61 stroke patients residing in an infirmary was conducted. Baseline demographic data, including age, gender, smoking habit, and alcohol consumption, were obtained on admission. Nutritional status was assessed according to anthropometric parameters. Malnutrition was defined as having a body mass index (BMI) of below 18.5 kg per square metres for both gender and a serum albumin level of less than 35 g/L. 12 risk factors associated with malnutrition were evaluated according to established protocols.

Results: 61 of the 93 patients assessed had a history of cardiovascular accident and gave consent to participate in the study. Among them were 28 (46 percent) women and 33 (54 percent) men. The mean length of stay of these patients was 850 days (or 28 months). The mean age of these patients was 76 (standard deviation 12.8) years. Among the patients, five (8.2 percent) were malnourished and 56 (91.8 percent) were adequately nourished. There were no significant differences in the distribution of eight risk factors between the malnourished and nourished groups. These risk factors were a previous history of alcohol consumption, comorbidities (five or more), polypharmacy (five or more), diabetes mellitus, impaired functional status of daily living, impaired mobility (wheelchair- or bed-bound), tube-feeding, and dentulism. Insufficient data was available to assess the effects of two risk factors: depressed mood and impaired cognitive function. The distribution of another two risks factors (previous history of smoking and dysphagia) was significantly different between the malnourished and nourished groups. Odds ratios of smoking and dysphagia associated with malnourishment were approximately 3.3 and 2.6, respectively.

Conclusion: Five of 61 (8.2 percent) stroke patients residing in an infirmary were malnourished. Two risk factors significantly associated with malnutrition were previous history of smoking and dysphagia. It is recommended that smoking history be elicited during routine history-taking of all stroke patients and particular nutritional attention be given to these at-risk patients. It is also emphasised that the management of dysphagia should follow a standardised protocol and form an integral element of patient care.

Keywords: elderly patients, infirmary, malnutrition, risk factors, stroke

INTRODUCTION
Malnutrition is common among patients who suffer from a stroke. The prevalence of malnutrition upon admission of acute stroke patients is reported to be between 8% and 49%. Malnutrition affects the clinical course of stroke patients. Compared with nourished patients, malnourished patients need a longer length of hospital stay, have an increased rate of complications, such as infection, pressure ulcers, falls, and increased frequency of dysphagia and enteral feeding. Acute stroke patients who have a lower serum albumin concentration were more likely than other stroke patients to have institutional care after hospital dismissal and to die during hospitalisation within the first three months after the stroke. Among 2,194 post-stroke patients followed-up in the Feed Or Ordinary Diet (FOOD) trial, undernourished poststroke patients had a significantly higher risk of dying than normal post-stroke patients at a median follow-up period of 196 days. Undernourished patients were also more likely to develop pneumonia, other infections, and gastrointestinal bleeding during admission than other patients. Another study of 185 stroke patients revealed that undernourished patients were more likely than properly-nourished patients to die or have a poor outcome. (6)
Table I. Methodology of risk factor assessment.

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Methodology</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of smoking</td>
<td>Recorded at admission according to patient history</td>
<td>Classified as (i) nonsmoker; and (ii) ex-smoker</td>
</tr>
<tr>
<td>History of alcohol consumption</td>
<td>Recorded at admission according to patient history</td>
<td>Classified as (i) nondrinker; and (ii) ex-drinker</td>
</tr>
<tr>
<td>Comorbidities</td>
<td>According to medical history</td>
<td>Defined as ≥ 5 medical conditions</td>
</tr>
<tr>
<td>Polypharmacy</td>
<td>According to medical history</td>
<td>Defined as those taking ≥ 5 medications regularly</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>Recorded on admission and undergoing therapy</td>
<td></td>
</tr>
<tr>
<td>Depressed mood</td>
<td>Chinese version of Geriatric Depression Scale (GDS)(^{16})</td>
<td></td>
</tr>
<tr>
<td>Impaired cognitive function</td>
<td>Mini-mental State Examination Scale (MMSE)—Cantonese version(^{16})</td>
<td>At or below 8 points on a 15-point scale indicating depression.</td>
</tr>
<tr>
<td>Impaired functional status</td>
<td>Barthel Index (BI) assessed by occupational therapist(^{14})</td>
<td>At or below 19 points on a 30-point scale indicating cognitive impairment</td>
</tr>
<tr>
<td>activity of daily living (ADL)</td>
<td></td>
<td>At or below 20 points on a 100-point scale indicating total dependence</td>
</tr>
<tr>
<td>Impaired mobility</td>
<td>Assessed by physiotherapist</td>
<td>Wheelchair-bound or bed-bound, classified as (i) walking unaided; (ii) walking with aid; (iii) Wheelchair-bound; or (iv) bed-bound</td>
</tr>
<tr>
<td>Dysphagia</td>
<td>Those diagnosed prior to admission OR diagnosed by speech therapists upon referral for assessment due to: (1) choking during meal; (2) patients’ complaint of swallowing difficulty; or (3) repeated chest infection</td>
<td>Dysphagia Management Protocol - Coordinating Committee in Speech Therapy, Hong Kong Hospital Authority(^{17})</td>
</tr>
<tr>
<td>Tube-feeding</td>
<td>Recorded on admission OR prescribed before study period</td>
<td>Ryle’s tube-feeding OR percutaneous endoscopic gastrostomy (PEG) feeding</td>
</tr>
<tr>
<td>Edentulism</td>
<td>Oral examination under artificial lighting</td>
<td>Edentulous patients with or without dentures</td>
</tr>
</tbody>
</table>

Malnutrition appears to be particularly prone among stroke patients with certain risk factors. Unoosson et al found that physically-dependent patients were more likely to be malnourished than independent patients at admission and at the two- and nine-week follow-up visits.\(^{22}\) During acute stroke, intracerebral haemorrhage stroke patients were significantly more likely to develop malnutrition than were cerebral infarction stroke patients and age-matched nonstroke patients.\(^{3}\) Furthermore, a 14-month prospective study of 49 stroke patients showed that dysphagia and tube-feeding were both significantly associated with malnutrition at admission into a rehabilitation hospital, although these two factors were not significantly associated with malnutrition one month after admission.\(^{9}\) At admission, factors such as age, gender, location or type of stroke, paresis of the dominant arm, socioeconomic status or education were not significantly associated with malnutrition. Except for advanced age (> 70 years), these factors remained not significantly associated with malnutrition one month after admission.\(^{9}\)

Thus, there is ample evidence that nutritional status affects the clinical outcome of stroke patients. Certain risk factors may predispose the stroke patients to be malnourished. The purpose of the present study was to investigate the risk factors associated with malnutrition in stroke patients residing in an infirmary in Hong Kong. The hypothesis of the study was that the risk of malnutrition would not be increased by factors affecting nutritional intake, such as a history of smoking, history of alcohol consumption, comorbidities, polypharmacy, diabetes mellitus, depressed mood, impaired cognitive function, impaired functional status activity of daily living, impaired mobility, dysphagia, tube-feeding and edentulism.

**METHODS**

This was a cross-sectional retrospective study conducted at the end of year 2002. Patients with a history of stroke residing in Cheshire Home (CH), Chung Hom Kok, Hong Kong, for infirmary care under the Hospital Authority Central Infirmary Waiting List (HACIWL) were invited to participate. Among the 240 beds provided by CH, 100 of them (50 for men and 50 for women) were reserved for the provision of infirmary care under HACIWL since 1998. The referral criteria of patients to HACIWL were based on an assessment of mobility, mental state and continence state. Patients who were admitted for infirmary
care had significant comorbidities, impaired mobility and impaired cognition and were dependent on assistance for daily activities. Exclusion criteria of the study were: patients with acute medical conditions requiring transfer to other hospitals for management; patients with limb amputation or deformity; and patients (or relatives) unable or unwilling to give informed consent.

Baseline demographic data including age, gender, smoking habit and alcohol consumption, were obtained on admission. Nutritional status was assessed in terms of body mass index (BMI), which is defined as weight in kilogramme (kg) divided by the square of the height in metres (m), and serum albumin level. The weight (to nearest 0.1 kg) was measured with the subject wearing a patient’s uniform and without shoes in a wheelchair on a digital scale (SR Scales, SR Instruments Inc, NY, USA), and the weight of the wheelchair was deducted. Height (to the nearest 1 cm) was measured by conversion from the subject’s knee heel height. Malnutrition was defined as a BMI of below 18.5 kg/m² for both gender (reference range: 18.5–22.9 kg/m²) and a serum albumin concentration of less than 35 g/L (reference range: 35–50 g/L). Blood tests were also performed on admission to assess the complete blood profile; renal and liver function tests, fasting blood glucose level and lipid profile analyses were also conducted. The blood tests were repeated annually unless clinically indicated. Risk factors associated with malnutrition were assessed on admission and are outlined in Table I.

Patients who were underweight (BMI < 18.5 kg/m²) or overweight (BMI > 23 kg/m²) were referred to a dietitian for advice. For all patients, the body weight was recorded every three months for monitoring purposes. If a patient showed a significant weight loss, i.e. more than 10% over 180 days, then he/she was assessed by the physician-in-charge for correctable causes, such as underlying medical illness, swallowing problems, mood disorders or side effects of drugs. The identified cause was then managed accordingly. These patients were also referred to a dietitian for advice on dietary supplements. Dietary intake and waste output were recorded and reviewed regularly to ensure adequate daily oral intake. The need of dietary supplementation was reviewed regularly by a dietitian. The data was analysed using the Statistical Package for the Social Sciences version 11.5 (SPSS Inc, Chicago, Ill., USA). The dichotomous distribution of risk factors between the malnourished and nourished patients was subjected to risk estimation and reported as the odds-ratio with a confidence interval at 95%.

Table II. Dichotomous distribution of risk factors in malnourished and nourished subjects.

<table>
<thead>
<tr>
<th>Distribution of risk factor in</th>
<th>Malnourished subjects</th>
<th>Nourished subjects</th>
<th>Odds-ratio (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of smoking</td>
<td>4/5</td>
<td>13/53</td>
<td>3.26 (1.71–6.21)</td>
<td>0.023^p</td>
</tr>
<tr>
<td>History of alcohol consumption</td>
<td>1/5</td>
<td>7/52</td>
<td>1.48 (0.27–9.8)</td>
<td>0.545</td>
</tr>
<tr>
<td>Comorbidities</td>
<td>4/5</td>
<td>45/56</td>
<td>1.00 (0.63–1.57)</td>
<td>0.679</td>
</tr>
<tr>
<td>Polypharmacy</td>
<td>2/5</td>
<td>16/56</td>
<td>1.40 (0.44–4.43)</td>
<td>0.465</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1/5</td>
<td>20/56</td>
<td>0.56 (0.09–3.34)</td>
<td>0.433</td>
</tr>
<tr>
<td>Depressed mood</td>
<td>0/1</td>
<td>3/24</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Impaired cognitive function</td>
<td>1/3</td>
<td>2/33</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Impaired functional status (ADL)</td>
<td>4/5</td>
<td>31/48</td>
<td>1.24 (0.76–2.01)</td>
<td>0.442</td>
</tr>
<tr>
<td>Impaired mobility</td>
<td>5/5</td>
<td>51/56</td>
<td>1.10 (1.01–1.19)</td>
<td>0.642</td>
</tr>
<tr>
<td>Dysphagia</td>
<td>4/5</td>
<td>17/56</td>
<td>2.63 (1.46–4.76)</td>
<td>0.044^p</td>
</tr>
<tr>
<td>Tube-feeding</td>
<td>2/5</td>
<td>10/56</td>
<td>2.04 (0.62–6.76)</td>
<td>0.287</td>
</tr>
<tr>
<td>Edentulism</td>
<td>2/5</td>
<td>15/56</td>
<td>1.40 (0.44–4.42)</td>
<td>0.465</td>
</tr>
</tbody>
</table>

* Statistical significant difference between the malnourished and nourished subjects in the parameter (p < 0.05).
* Data is expressed as number of patients/total in group.
25 patients were unable to complete the assessment for depressed mood and impaired cognitive function, respectively, resulting in insufficient data generated for the analysis of these two risk factors. Although depressed mood and impaired cognitive function are also potential risk factors for malnutrition, they were excluded in this study because both Geriatric Depression Scale (GDS) and Mini-mental State Examination (MMSE) require the subjects’ verbal response, which was difficult to assess in the present group of stroke patients.

According to the dichotomous distribution of risk factors, it was found that there was no significant difference in the distribution of eight risk factors between the malnourished and adequately nourished groups. These risk factors included a previous history of alcohol consumption, comorbidities (≥ 5 medical conditions), polypharmacy (≥ 5 regular medications), diabetes mellitus, impaired functional status of daily living, impaired mobility (wheelchair-bound or bed-bound), tube-feeding, and edentulism. Two risks factors emerged to be significantly different between the malnourished and adequately nourished groups. They are: previous history of smoking and dysphagia (Table II). The odds of smoking and dysphagia were increased among the malnourished subjects (odds ratios 3.3 and 2.6, respectively) (Table II).

DISCUSSION

The present study showed that the prevalence of malnutrition in a group of stable stroke patients residing in an infirmary was 8.2%. This prevalence is low, in comparison with stroke patients in overseas studies evaluated at admission (8%–49%), patients admitted to a convalescent and rehabilitation hospital (16.7%), and institutionalised residents (21.6%) in Hong Kong. Considering the multiplicity of risk factors of malnutrition that were potentially operative, the low prevalence of malnutrition in stroke patients is encouraging. For example, among the 61 patients studied, 17 were previous smokers, 49 had more than five medical conditions, 18 were taking more than five medications regularly, 21 had diabetes mellitus, 56 were wheelchair-bound or bed-bound, 21 were dysphagic, 21 relied on tube-feeding, and 17 were edentulous (Table II). The low prevalence of malnutrition may also reflect the nutritional care given to the patients in this infirmary. Experience elsewhere has shown that the implementation of a standardised approach to nutritional care of the stroke patient is necessary.

For example, the National Clinical Guidelines for Stroke prepared by the Intercollegiate Stroke Working Party in the UK recommended that within 24–48 hours after admission of the stroke patient, a multidisciplinary assessment of the patient’s status should include cognitive impairment, nutritional status, ability to communicate and self-care. Patients showing signs of dysphagia, or who are at risk of pulmonary aspiration, should be evaluated for swallowing function by an appropriately trained specialist, who should also advise on safe swallowing and the appropriate consistency of food and fluid. The dysphagic patient should be supported with proper nutrition and fluid intake, assessed for feeding posture and equipment aid, prescribed with food of an appropriate consistency and medication in an appropriate formulation, and evaluated for enteral feeding, with the tube promptly removed when it is no longer needed.

Among the 12 risk factors of malnutrition analysed statistically in the present study, eight were shown not to be significant risk factors. These were a previous history of alcohol consumption, comorbidities (≥ 5), polypharmacy (≥ 5), diabetes mellitus, impaired functional status of daily living, impaired mobility (wheelchair-bound or bed-bound), tube-feeding, and edentulism. Thus, the hypothesis that the risk of malnutrition would not be increased by these eight factors was accepted. Insufficient data was available to assess the effects of two risk factors: depressed mood and impaired cognitive function.

Drinking affects the outcome of many chronic diseases and thus should not be overlooked in the stroke patient as a potential risk factor of malnutrition. A previous history of alcohol consumption was not shown to be a significant risk factor of malnutrition in this study. This may not be surprising because cessation of alcohol consumption on admission into the infirmary was likely to have ameliorated effects that previous alcohol consumption had on nutritional status. Nevertheless, it should be noted that the quantity and frequency of alcohol consumption are known to affect the quality of diet. In the 1999–2000 US National Health and Nutrition Examination Survey, the quality of diet was found to worsen with increased alcohol consumption quantity but to improve with increased alcohol consumption frequency. The lowest quality of diet was found among drinkers with the largest quantity and lowest frequency of alcohol consumption. There is also evidence that binge drinking and alcohol consumption of more than four drinks/day are associated with obesity in an epidemiological survey. Conversely, alcoholics without clinical signs of liver cirrhosis and malabsorption were shown to have significantly lower body weight and fat mass when compared with a control group of healthy social drinkers.

Comorbidities (of five or more medical conditions) were not a significant risk factor of malnutrition in this study. This finding is in agreement with that of a Swedish study showing that the BMI of 231 patients with dementia did not differ, regardless of whether they had no mild or severe morbidities. This finding does not imply that comorbid conditions of the stroke patient should receive
Thus, given can possibly convalesce of malnutrition. On (edentulism) present teeth two- and nine weeks, albumin concentration patients that showed bound were not associated with malnutrition. Second, associated nutritional status rehabilitation hospital. First, diabetes mellitus is nutritional restriction imposed with malnutrition. It is been shown that diabetes mellitus affecting stroke patients, although not significantly different from each other. Hence, the malnutrition effect of smoking on stroke patients may have a longer term detriment than on the general population. A further study is necessary to test this hypothesis. On the basis of the finding that a history of smoking is a significant risk factor of malnutrition in this study, it is recommended that the smoking history be elicited during routine history-taking of all stroke patients and particular nutritional attention be given to these at-risk patients.

Dysphagia was the other significant risk factor of malnutrition in this study. In a Swedish study of 162 stroke patients undergoing rehabilitation, 80% had eating difficulties, including dysphagia, although only 52.5% were dependent on assisted eating. This Swedish study highlights the high prevalence of eating difficulties among stroke patients, although not all of them required eating assistance. The prevalence of dysphagia among the current patient population is lower, at 34%. In a study of 49 stroke patients placed on rehabilitation service, dysphagia was significantly associated with malnutrition at admission but not at subsequent follow-ups. The incidence of dysphagia in that study, decreased from 45% at admission to 17% at follow-up. Others have also discussed the importance of managing dysphagia in improving the nutritional health of stroke patients. The management of dysphagia in the present study received utmost attention and followed a protocol issued by the Hong Kong Hospital Authority.
Among other measures, the management protocol emphasises early assessment by qualified professionals with an interdisciplinary approach, as well as dietary, swallowing, feeding evaluations and prescription. Given the finding that dysphagia is a significant risk factor of malnutrition in this study, the management of dysphagia with a standardised protocol, and recognition that it is an integral element of patient care, cannot be overemphasised.

In summary, 8.2% of 61 stroke patients residing in an infirmary was found to be malnourished. The two risk factors found to be significantly associated with malnutrition in these patients were a previous history of smoking and dysphagia. However, these findings are indicative rather than conclusive, and a further study with a larger number of patients for confirmation of the findings is suggested. It is recommended that a smoking history be elicited during the routine history-taking of all stroke patients and particular nutritional attention be given to these at-risk patients. It is also emphasised that the management of dysphagia should follow a standardised protocol and be considered an integral element of patient care.

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