Nutritional Disorders & Therapy

Khalaf et al., J Nutr Disorders Ther 2011, 1:2
DOI: 10.4172/2161-0509.1000104

Research Article Open Access

# Undernutrition Risk, Overweight/Obesity, and Nutritional Care in Relation to Undernutrition Risk among Inpatients in Southwestern Saudi Arabia. A Hospital-Based Point Prevalence Study

**Atika Khalaf[1,2]*, Vanja Berggren[1,2], Hazzaa Al-Hazzaa[3], Staffan Bergström[2] and Albert Westergren[1]**

[1]School of Health and Society, Kristianstad University, Sweden
[2]Department of Public Health Sciences, The Division of Global Health (IHCAR), Karolinska Institute, Sweden
[3]Exercise Physiology Laboratory, and Obesity Research Chair, King Saud University, Riyadh, Saudi Arabia

## Abstract

**Background:** Undernutrition is a problem in institutional care, where 20–46% of all inpatients are classified as being "at nutritional risk". This study explores the prevalence of undernutrition risk and overweight/obesity and the targeting of nutritional care in relation to undernutrition risk among inpatients in southwestern Saudi Arabia.

**Methods:** A cross-sectional, point prevalence study was carried out in a Central hospital in southwestern Saudi Arabia. The subjects were inpatients, over the age of 18 who had their nutritional status assessed. Moderate/high undernutrition risk was defined as the occurrence of at least two of: weight loss, low BMI, and/or eating difficulties. Overweight/obesity was graded by using Caucasian and Asian cut-offs for BMI.

**Results:** Out of 219 patients 166 (76%) agreed to participate (106 men and 60 women) with a significantly higher drop-out among women (n=35, 37% vs. men n=18, 14%). There was no significant difference in the prevalence of moderate/high undernutrition risk between men and women (40% vs. 38%) but more women (29% or 40%, depending on cut-off) than men (10% or 23%) were obese. Among patients at moderate/high undernutrition risk, more women (61%) than men (31%) were served small portions.

**Conclusions:** There is a need to increase awareness about nutrition among nurses, to implement nutritional guidelines and to do more research regarding overweight/obesity among the female population. Motivational strategies need to be developed to focus on increasing the Saudi female participation in research.

**Keywords:** MEOF-II; Malnutrition; Undernutrition; Overweight; Saudi Arabia; Nursing

## Introduction

An increase in the prevalence of overweight and obesity during the past three decades is seen as an emerging problem in Saudi Arabia [1], as well as worldwide [2]. As a consequence many inpatients in western countries have been found to be overweight or obese [3, 4]. Less is known about the coinciding prevalence of undernutrition in the Middle Eastern region [5], as well as in hospital samples there. Undernutrition is, however, well documented in western hospital samples [6, 7, 8, 4]. Thus, there is a need for more research on the prevalence of undernutrition and overweight (including obesity), in hospital-based settings in Saudi Arabia. In addition, research is needed about the targeting of nutritional interventions towards patients at risk of undernutrition.

## Background

According to the World Health Organization, there are more than one billion overweight adults in the world. At least 300 million of them are clinically obese [9] and of these about 115 million come from developing countries [10]. Current obesity levels range from under 5% in China, Japan and certain African nations, to over 75% in urban Samoa. But even in countries with relatively low prevalence, such as China, rates are almost 20% in some cities [10]. Furthermore, in the past 20 years, the rates of obesity have tripled in developing countries [11].

Saudi Arabia, a developing country, is undergoing rapid urbanization changes. This has a direct impact on its people's dietary habits and physical activity patterns. According to national studies, it is common to skip meals and to replace them with daily snacks, and most of these snacks are high in calories and low in nutrients [12, 13]. Moreover, there are gender differences in the prevalence of overweight and obesity. The prevalence of overweight ranges from 25.2% to 31.5% for women and 30.7% to 33.1% for men [14, 15, 16, 17, 18]. Obesity, on the other hand, ranges from 23.6% to 26.6% among women and from 14.2% to 17.8% among men [14, 15, 16, 17, 18]. In addition, obesity is present in all age groups [14, 15, 16, 17, 18], which is a clear sign that changes must be made to the lifestyle of the Saudi population in order to reduce the high prevalence of obesity. Most likely the prevalence of obesity among inpatients in Saudi Arabia is even higher than described above, as such conditions are connected to other health problems [19].

Underlying factors associated with overweight and obesity, as shown in different population-based studies, are physical inactivity [5, 20, 21], diabetes [22, 23], dietary habits [13], gender [1, 14, 16], employment and education [13, 24]. Since obesity and overweight are serious problems that pose a huge and growing public health problem worldwide, this needs to be studied further.

Besides overweight/obesity, undernutrition is also a problem in institutional care. For instance, in a Swedish study 27% of respondents in hospitals were considered to be at moderate or high risk of

***Corresponding author:** Atika Khalaf, School of Health and Society, Kristianstad University, SE-291 88 Kristianstad, Sweden, Tel: 044-12 96 51; E- mail: atika.khalaf@ki.se

**Received** November 28, 2011; **Accepted** December 12, 2011; **Published** December 14, 2011

**Citation:** Khalaf A, Berggren V, Al-Hazzaa H, Bergström S, Westergren A (2011) Undernutrition Risk, Overweight/Obesity, and Nutritional Care in Relation to Undernutrition Risk among Inpatients in Southwestern Saudi Arabia. A Hospital-Based Point Prevalence Study. J Nutr Disorders Ther 1:104. doi:10.4172/2161-0509.1000104

undernutrition (criteria: unintentional weight loss, underweight, eating difficulties) [3], and using the same methodology the prevalence was found to be 25% in an Icelandic hospital before an intervention and 17% afterwards [25]. In other western studies the prevalence of undernutrition in hospital samples ranges between 20% and 46% [6, 7, 8, 4]. A literature search in relevant scientific databases for the prevalence of undernutrition among Saudis showed only two studies [26, 27] that explicitly concerned undernutrition in specific groups in Saudi Arabia. One was about adolescent girls in eastern Saudi Arabia [26], and the other was about men living in a nursing home in Riyadh [27]. Thus, there is a lack of studies conducted within Saudi hospitals that focus on undernutrition. In addition, there are no data regarding the targeting of nutritional care actions for patients at undernutrition risk in a hospital sample in Saudi Arabia. Such studies are important for the implementation of nutritional guidelines and might contribute to a greater understanding of possible facilitating and hindering factors in nutritional care in Saudi Arabia. Thus, the aim of the study was to examine the prevalence of undernutrition risk, overweight and obesity among female and male inpatients in hospital-based settings in southwestern Saudi Arabia. It was also the aim of this study to explore the targeting of nutritional care for patients at risk of undernutrition.

## The Study

### Design

This study is based on the point prevalence method, which was used to measure the total number of patients at risk of malnutrition at a given time, according to a method described by Westergren et al. (2008). The methodology of point prevalence surveys of nutrition has been successfully used in previous studies in Sweden [3, 28, 29] and in Iceland [25]. Point prevalence studies can be performed at a relatively modest cost and include total populations [30].

### Context

The capacity of the hospital where the study took place is 658 beds (including 193 beds in ambulatory wards such as Outpatient Department, Endoscopy, Operating Room, Emergency and Artificial Kidney Unit). The hospital, which is about 25 years old, provides 24-hour emergency admission and consultants from different specialties. The hospital is the biggest governmental hospital in southwestern Saudi Arabia, a central and specialized hospital, covering all of Abha city (Aseer province's capital) and its population of about 400,000. The hospital was visited by 104,000 persons in 2009, but is prepared to meet the needs of 150,000 patients per year. During 2009, 12,065 patients were admitted (Hospital Statistical Department).

### Sample

All wards (male surgical, medical, orthopedic, urological, neurological and cardiological wards, as well as female surgical, medical and female fine surgical wards) in the hospital were involved. Pediatrics, ICU and emergency wards were not included. The inclusion criteria were all adult in-hospital patients (18 years or over) registered at the ward between 7 a.m. and 9 p.m. All patients were informed (orally and in writing) by the registered nurse about the study, and consent was obtained during the data collection day.

A total of 219 patients were available for inclusion in the investigated wards. Of these, 166 (76%) chose to participate and 53 (24%) chose not to participate. Significantly (p-value <0.0005) more women (n=35, 37%) than men (n=18, 14%) did not participate in the study. Those not participating had significantly longer hospital stay than included patients, between admission and survey (median 12 and 6 days respectively, p-value = 0.001) (Table 1).

### Data collection

A pilot study was carried out in March 2009, when 30 patients were interviewed and had their nutritional status assessed and BMI measured. In the pilot data collection, the staff involved answered an open-ended questionnaire giving suggestions for modifications. The form was then slightly altered to accommodate local cultural needs and differences that were found. One example is that "Date of birth" was changed to "Age". The data collection was conducted during one day in July 2009. The assessment of eating difficulties was performed at breakfast or at lunchtime for each patient.

Information was given to the management and to all departments at the hospital. One or two registered nurses for each ward (n=7) were selected to perform the data collection during the one set day. The nurses concentrated solely on data collection that day, so they were not involved in the daily work at the wards. The nurses were given instructions, individually and as a group, in how to ask for informed consent, collect the data and fill in the form. The researcher (AK) was present all day long to answer questions that arose during the data collection. The following day, the researcher visited each ward, checking whether there had been any new admission during the previous evening (before 9 p.m.). Data were collected through measures of height and weight, interviews and observations of each patient during mealtimes. Data about nutritional care provided to patients, admission weight and height, and contact with dietitian were obtained through nursing and medical records.

### Instruments and definitions

**Nutritional assessment**: Risk of undernutrition was estimated according to Swedish recommendations [31]. The Swedish recommendations state that risk of undernutrition can be estimated from the occurrence of any of the following: involuntary weight loss

| | Included | External Drop-out | P-value |
|---|---|---|---|
| | n=166 | n=53 | |
| Age, mean (SD) | 48.5 (22.3) | 50.4 (22.9) | 0.586 |
| Age group | | | 0.574 |
| <70 years, (%) | 122 (73) | 41 (77) | |
| ≥70 years, (%) | 44 (27) | 12 (23) | |
| Sex | | | **<0.0005** |
| Men | 106 (64) | 18 (34) | |
| Women | 60 (36) | 35 (66) | |
| Days since hospital admission, median (q1-q3) | 6 (3-14) | 12 (5-28) | **0.001** |
| Distribution of patients within specialties, % | | | |
| Medicine | 22 | | |
| Surgery | 42 | | |
| Orthopaedic | 10 | | |
| Neurology | 7 | | |
| Cardiology | 11 | | |
| Urology | 8 | | |
| | | | |
| Distribution of patients according to most common diagnostic categories, % | | | |
| Orthopaedic | 22 | | |
| Trauma | 19 | | |
| Gastrointestinal | 16 | | |
| Neurological | 8 | | |
| Pulmonary | 7 | | |

ANOVA, Chi-square test, Mann Whitney *U*-test
q1-q3 = first-third quartile

**Table 1:** Comparisons between included patients and drop-outs.

(irrespective of time and amount), BMI below limit (Table 2) and the presence of eating difficulties (in this study measured according to Minimal Eating Observation Form – Version II (MEOF-II), [28]). Unintentional weight loss, low BMI and change in food intake have a reasonable evidence base in the literature, correlating with changes in function and clinical outcome [32]. Little risk of undernutrition was defined as one criterion fulfilled, moderate risk as two criteria fulfilled and high risk as three criteria fulfilled. In this study, it was decided that if two or three of the above (three) criteria were fulfilled, the person should be considered at risk of undernutrition.

Height and weight were measured using tape measure and manual scales, i.e. the standard equipment available at the particular units. The presence of oedema/ascites was assessed.

The standardized assessments of eating, using MEOF-II, included: sitting position, manipulating food on the plate, transporting food to the mouth, chewing, manipulating food in the mouth, swallowing, food consumption (3/4 or less of standardized portion size), reduced alertness and appetite [28]. The MEOF-II was validated (using Factor Analysis among 2600 patients) and had good reliability, with an average agreement between observers of 89% (Kappa coefficient 0.70) [28]. In a systematic review, MEOF-II was found to be the psychometrically most robust instrument to screen for eating difficulties, and for use in clinical practice and research [33].

In general, Asians have a higher percentage of body fat than Caucasians at the same BMI cut-off levels, and the health risks associated with obesity occur at a lower BMI cut-off level than among Caucasians [34, 35]. Therefore, two different age-adapted BMI cut-off recommendations were used to estimate the prevalence of overweight/obesity, i.e. Asian and Caucasian. The recommendations were adapted to age, as the BMI values associated with the lowest mortality rate are somewhat higher for the elderly than for younger people (in the same way as the limits have been adapted for undernutrition in the Swedish recommendations [31]). Another argument for adapting cut-offs to age is that people become shorter with age, causing a false overestimation of overweight when using BMI [3]. First, then, recommendations from the Regional Office for the Western Pacific Region of WHO with the International Association for the Study of Obesity (IASO) and the International Obesity Task Force (IOTF) were used [34, 35], defining overweight in Asians as a BMI >23.0. Second, Caucasian cut-offs for BMI recently used in a Swedish study were used [3] (Table 2).

**Nutritional care:** Nutritional care provided to patients included registration of food and beverage intake, BMI documentation, adapted food consistency, portion size, artificial nutrition (AN), pre- and/or postoperative AN, eating assistance and dietitian consultation, protein- and energy-enriched food, and oral supplements.

### Ethical considerations

The ethical principles for conducting scientific work were followed according to the Declaration of Helsinki [36]. This study was approved at the hospital, the local ethics committee (No. 50/80/26889), and the Ministry of Health (20 April 2009). The patients or close relatives were asked for their informed consent. Both verbal and written information was given and patients were guaranteed anonymity.

### Data analysis

Comparisons were made between independent groups, and analysis was chosen depending on data level. ANOVA was used only for comparisons of age, chi-square test (when applicable Fisher's exact test) for nominal level of data, and Mann-Whitney *U*-test for ordinal level of data and for ratio scale without normal distribution [37]. P-values below 0.05 were considered statistically significant. Analyses were performed with SPSS 17.0 for Windows.

## Results

Out of the 166 patients participating in the present study, there were 106 men with a mean age of 45.2 years, ranging from 21 to 89, and 60 women with a mean age of 54.4 years, ranging from 21 to 100. Most of the men were admitted to surgical, orthopedic and cardiology wards and the women to surgical and medical wards (Table 3). The distribution of patients according to the most common diagnostic categories differed between male and female inpatients; 31% of the men were admitted to orthopedic wards and 29% were admitted because of trauma, while among the women, 18% were admitted because of gastrointestinal conditions and 18% because of neurological diseases (Table 3).

A high percentage of both men and women had eating difficulties according to MEOF-II: 64% and 62% respectively (Table 3). More men (17%) than women (2%) had difficulties within the category food intake (sitting position, manipulating food on plate, conveying food to mouth (Table 4)). Most (n=15) of these men (n=18) with food intake difficulties were in hospital due to trauma. Low BMI was found among 23% and 22%, and unintentional weight loss among 46% and 43% of men and women respectively. Forty percent of the men and 38% of the women were at moderate or high risk of undernutrition (Table 3).

Many of the patients (45% of the men and 49% of the women) were overweight or obese, according to the Caucasian cut-offs. The prevalence of obesity grade 2 or 3 (obesity or severe obesity) was significantly higher among women (29%) than among men (10%) (Table 3).

Using the Asian cut-offs for BMI, the prevalence of overweight/obesity was even higher, 51% among men and 62% among women, and the prevalence of obesity grade 2 or 3 was significantly higher among women (40%) than among men (23%) (Table 3).

There were no significant differences in nutritional interventions between men and women except served portion size. Among patients at moderate/high nutritional risk, more women (61%) than men (31%) were served small portions, even though there was no significant gender difference regarding BMI (mean BMI women 24.3 vs. men 22.6). Only a few patients at moderate/high undernutrition risk received nutritional interventions such as having their food intake registered (≤21%), being provided oral supplements (≤21%), receiving artificial nutritional support (≤29%), or being provided partial or total eating assistance (≤29%) (Table 5).

## Discussion

The findings of the present study reveal that the prevalence of undernutrition risk was similar among men and women, while more women were obese. Among those at risk of undernutrition, few received nutritional interventions and more women than men were

| | Caucasian | | Asian | |
|---|---|---|---|---|
| | ≤ 69 years | ≥ 70 years | ≤ 69 years | ≥ 70 years |
| Underweight, BMI | <20 | <22 | <20 | <22 |
| Overweight | | | | |
| Grade 1. Overweight, BMI | 25–29 | 27–31 | 23–27 | 25–29 |
| Grade 2. Obesity, BMI | 30–39 | 32–41 | 28–37 | 30–39 |
| Grade 3. Severe obesity, BMI | >40 | >42 | >38 | >40 |

**Table 2:** Age-adapted BMI cut-offs used in the study.

| | Men | Women | |
|---|---|---|---|
| | n=106 | n=60 | P-value |
| Age | | | **0.010** |
| Mean | 45.2 | 54.4 | |
| SD | 21.9 | 22.1 | |
| Range | 21–89 | 21–100 | |
| Age group, % | | | **0.009** |
| <70 years, (%) | 80 | 62 | |
| ≥70 years, (%) | 20 | 38 | |
| | | | |
| Days since hospital admission, median (q1-q3) | 7 (2-17) | 5 (3-12) | 0.603 |
| | | | |
| Distribution of patients within specialties, % | | | |
| Medicine | 12 | 38 | **<0.0005** |
| Surgery | 31 | 62 | **<0.0005** |
| Orthopaedic | 16 | 0 | – |
| Neurology | 10 | 0 | – |
| Cardiology | 18 | 0 | – |
| Urology | 12 | 0 | – |
| | | | |
| Distribution of patients according to most common diagnostic categories, % | | | |
| Orthopaedic | 30 | 8 | **0.001** |
| Trauma | 29 | 0 | – |
| Gastrointestinal | 14 | 18 | 0.476 |
| Neurological | 3 | 18 | **0.001** |
| Pulmonary | 5 | 10 | 0.207 |
| | | | |
| Criteria for UN risk, % | | | |
| Eating difficulties according to MEOF-II | 64 | 62 | 0.750 |
| Low BMI [a)] | 23 | 22 | 0.902 |
| Unintentional weight loss | 46 | 43 | 0.719 |
| | | | |
| Fulfilling UN risk criteria, % | | | 0.633 |
| No criteria – no UN risk | 14 | 20 | |
| One criteria – low UN risk | 46 | 42 | |
| Two criteria – moderate UN risk | 34 | 31 | |
| Three criteria – high UN risk | 6 | 7 | |
| UN risk, moderate or high, % | 40 | 38 | 0.870 |
| | | | |
| Overweight (adapted for Caucasians), % | | | 0.152 |
| No overweight | 54 | 51 | |
| Grade 1, overweight [a)] | 35 | 20 | |
| Grade 2, obesity [b)] | 10 | 22 | |
| Grade 3, severe obesity | 0 | 7 | |
| Obesity, grade 2 or 3, % | 10 | 29 | **0.003** |
| | | | |
| Overweight (adapted for Asians), % | | | 0.041 |
| No overweight | 48 | 38 | |
| Grade 1, overweight [a)] | 28 | 22 | |
| Grade 2, obesity [b)] | 23 | 31 | |
| Grade 3, severe obesity | 0 | 9 | |
| Obesity, grade 2 or 3, % | 23 | 40 | **0.028** |

ANOVA, Chi-square test with Fisher's exact test when applicable and Mann Whitney *U*-test. MEOF-II = Minimal Eating Observation Form – Version II. q1-q3 first-third quartile
[a]One male had oedema/ascites
[b]One female had oedema/ascites

**Table 3:** Characteristics and gender distribution of participants, and the point prevalence of risk of undernutrition (UN) and overweight among the studied patients.

served small portions even though there were no significant gender differences regarding BMI. Taken together, the findings are likely to be generalizable to local and regional hospitals with similar characteristics of case mix and culture. Considering the drop-outs, the generalizability to females might be somewhat limited. Yet the findings can also have implications for the interpretation of findings from studies about undernutrition and overweight/obesity that include immigrant women and men from the Middle East region, at least Saudi Arabia.

One of the limitations of the study is the nature of the cross-sectional study design, by which patients with longer length of hospital stay have higher probability of taking part on the point prevalence study [38]. However, in this study the relation between hospital stay and drop-out was shown to be the opposite. One explanation could be that patients with longer hospital stay have more severe or complex diseases and therefore are less likely to manage to participate in studies. Another limitation is the drop-out rate, which was remarkably higher among women (37%) than men (14%) in the present study. The finding appears similar to what was found in a previous Saudi study reporting a higher refusal rate among women than among men [39]. This possibly has implications not only for studies in Saudi Arabia or the Middle East region but also for efforts to involve immigrant women from this part of the world in studies conducted in other countries. Motivational strategies therefore need to be developed with a focus on increasing Saudi female participation in research.

In the present study, a high percentage (39%) of the participating patients was at moderate/high risk of undernutrition. Such findings are very similar to those reported (34%) by a Swedish study involving large university hospitals [29], and those reported from a European cross-sectional "Nutrition Day" survey (27%) [40]. The prevalence of low BMI (22% of men, 25% of women) was similar to findings in the Swedish study in large hospitals (22%) [29] and the European "Nutrition Day" survey (22%) [40]. However, the prevalence of unintentional weight loss (48% of men and 44% of women) was somewhat higher than what was found (40%) in the previously mentioned Swedish study [28] and in a "Nutrition Day" project, where data indicated a high prevalence of weight loss (41%) in both Japan and Europe [41]. In addition, the percentages of men (63%) and women (61%) who had eating difficulties in the present study are similar to the percentage (58%) found in the Swedish study [29]. When taking all three risk criteria together, the prevalence of moderate/high risk of undernutrition in our study was 40% among men and 38% among women, which is not very different from the percentage (34%) found in large hospitals in Sweden [28]. Thus, it is likely that the case mix in the Saudi Arabian hospital is similar to that found in Swedish university hospitals where patients are characterized by having more complicated diseases and not necessarily having great "severity of illness". High co-morbidity can also be an explanation for the high prevalence of undernutrition

| | Men | Women | |
|---|---|---|---|
| | n=106 | n=60 | P-value |
| **Eating difficulties**, % | | | |
| Food intake [1)] | 17 [4)] | 2 | 0.003 |
| Swallowing/mouth [2)] | 23 | 25 | 0.731 |
| Energy/appetite [3)] | 49 | 50 | 0.907 |

Chi-square test
[1)]Includes; sitting position, manipulating food on plate, conveying food to mouth
[2)]Includes: chewing, coping with food in mouth, swallowing
[3)]Includes: amount food eaten, energy to complete a meal, appetite
[4)]15 patients of these (n=18) had the diagnostic category of trauma

**Table 4:** Eating difficulties according to the Minimal Eating Observation Form – Version II, comparisons between men and women.

| | No/Low Risk of UN | | | Moderate/ High Risk of UN | | |
|---|---|---|---|---|---|---|
| | Men | Women | P-value | Men | Women | P-value |
| | n=64 | n=37 | | n=42 | n=23 | |
| Body Mass Index, mean (SD) | 25.6 (4.6) | 29.5 (7.7) | **0.004** | 22.6 (5.3) | 24.3 (6.7) | 0.225 |
| Registration of food intake | 6 (16) | 6 (9) | 0.306 | 9 (21) | 1 (4) | 0.068 |
| Registration of beverage intake | 5 (8) | 6 (16) | 0.191 | 5 (12) | 1 (4) | 0.411 |
| Is Body Mass Index documented | 1 (2) | 0 | – | 4 (9) | 1 (4) | 0.648 |
| Adapted consistency | | | | | | |
| Food | 6 (9) | 4 (11) | 0.816 | 4 (9) | 4 (17) | 0.356 |
| Beverage | 0 | 1 (3) | – | 0 | 0 | – |
| PE food | 0 | 0 | – | 0 | 0 | – |
| Oral Supplement | 15 (23) | 7 (19) | 0.596 | 9 (21) | 3 (13) | 0.405 |
| Portion size | | | **0.019** | | | **0.019** |
| Large/Medium (600–400 kcal) | 54 (84) | 29 (78) | | 29 (69) | 9 (39) | |
| Small (about 200 kcal) | 10 (16) | 8 (22) | | 13 (31) | 14 (61) | |
| Artificial nutr.(AN) support | | | | | | |
| Partial | 8 (12) | 7 (19) | 0.382 | 10 (24) | 5 (22) | 0.850 |
| Total | 3 (5) | 2 (5) | 0.999 | 2 (5) | 0 | – |
| Pre- and/or postoperative AN | 2 (3) | 0 | – | 0 | 0 | – |
| Eating assistance | 8 (12) | 7 (19) | 0.382 | 14 (33) | 7 (30) | 0.811 |
| Dietitian consulted | 4 (6) | 1 (3) | 0.650 | 0 | 0 | – |

Chi-square test with Fisher's exact test when applicable, and Mann Whitney *U*-test

**Table 5:** The precision (%) in the nutritional care for patients at no/low risk and for patients at moderate/high risk of undernutrition (UN). Comparisons between men and women at moderate/high UN risk.

risk [29]. However, the figures can also possibly be explained by the fact that few patients receive appropriate nutritional care, which increases the number of patients with unintentional weight loss.

The results of this study indicate that the nutritional care was not optimal. Nutritional routines are poor or lacking, and undernutrition is under-treated. BMI was seldom documented, food and beverage intake was seldom registered, few patients at nutritional risk received oral supplements, and no one was provided with protein- and energy-enriched food (Table 3). Furthermore, although women and men at moderate/high undernutrition risk had similar BMI, more women than men were served a small portion (61% vs. 31%). One explanation for this could be that women might have had relatives providing them with food bought outside the hospital. Other reasons could be that men were more active and thus were considered in need of more food. It could also be that staff incorrectly thought that the women needed to lose weight due to overweight/obesity, despite staying in hospital due to acute illness. If so, the patient could be put at increased risk of undernourishment. The poor targeting of nutritional interventions to patients at nutritional risk has previously been shown in Sweden [29]. In a recent intervention study in a hospital in Iceland a nutritional program was implemented and resulted in improved precision of individual nutritional care actions and in more patients getting their BMI documented [25]. Thus, in Saudi Arabian hospitals, as well as in other countries, it seems necessary to implement nutritional guidelines that focus on how to identify persons at risk of undernutrition and what measures to take for patients at risk.

Increasing the interdisciplinary collaborative care between various professions might improve nutritional care for patients in Saudi Arabia. Khalaf et al. (2009) emphasize the importance of multi-professional collaboration between, for instance, medicine, nursing care and a dietician [42]. Although dieticians have an important role in assessing nutritional status and patients' needs and in conducting follow-ups, there was hardly any such contact when the present study was conducted.

The explanations as to why the prevalence of overweight/obesity was so high in the study could be related to lifestyle. According to Asian cut-offs, obesity was more common in the Saudi Arabian hospital (men 23% and women 40%) than in Sweden (11–16%) and Iceland (17–24%), where Caucasian cut-offs were used [28, 25]. This difference might be explained by the modernization and affluence in Saudi Arabia over the last three decades, which has contributed to the high prevalence of obesity. Some consider obesity a sign of affluence [17]. The same phenomenon is seen in the eastern Mediterranean region, such as in Egypt, where a study assessing the nutritional state of nursing home residents was recently performed, and overweight and obesity were found to be the most prevalent clinical characteristics (89%) [43]. Furthermore, according to WHO, one of the major causes of the increase in the prevalence of overweight/obesity is the overall inadequate food safety and nutrition education among the general population [44]. At consumer and individual levels, risk factors are the very high intake of energy-dense foods and low vegetable/fruit consumption combined with a sedentary lifestyle with minimum physical activity, all existing within an overall environment of aggressive commercial marketing of fast foods [44].

In the present study, obesity was more frequent among female inpatients than among male inpatients. Those findings are, however, comparable to the overall prevalence of overweight and obesity in Saudi Arabia (64% men, 70% women) [45], and other countries in the region, where the prevalence of overweight/obesity ranges between 74% and 86% for women and 69% and 77% for men [44]. The prevalence of obesity was found to be higher in this study, including a hospital sample, than in the population in general. In the population obesity prevalence range from 23.6% to 26.6% among women and from 14.2% to 17.8% among men [14, 15, 16, 17, 18] while the corresponding figures in this study, using the Asian cut-offs were 40% among women and 23% among men. Taken together, as expected the prevalence of obesity was higher among inpatients than in the general population, corresponding to the fact that obesity is connected with health problems [19], increasing the need for hospital care.

With the outcomes of the present study, health authorities are recommended to address the problem of overweight and obesity through campaigns for nutritional education for the whole population, with special attention to the women's situation. Recommendations about how to prevent an increase in obesity in the Saudi Arabian population should include interventions aimed at increasing health-enhancing physical activity, reducing the increasing intake of high-calorie foods, and behavior modification. Patients should also be educated about the health risks associated with being overweight and encouraged to adopt a healthy lifestyle. Education about weight control and physical activity should be given in hospitals, and therapy started after hospital discharge when the health status has stabilized, i.e. not during the acute phase of disease.

## Conclusion

Even though a great number of patients are at nutritional risk, few receive adequate nutritional care. This indicates a need for increasing awareness among nurses and other professionals and for implementing nutritional guidelines. Health and nutritional care programs need to be developed and updated to target everyone working in healthcare, especially nurses, with specific reference to nutritional screening and interventions. In addition, obesity is common among patients, in particular among women, which indicates an urgent need for more research regarding this health problem, above all concerning the female population and with specific reference to their patterns of nutritional habits. Research is also needed in other hospitals in Saudi Arabia regarding undernutrition risk and the targeting of nutritional interventions. Moreover motivational strategies need to be developed with the focus on increasing Saudi female participation in research. The study can have implications for other Middle Eastern regions, as well as for countries with immigrants from this region.

### References

1. Al-Hazzaa HM (2007) Rising trends in BMI of Saudi adolescents: evidence from three national cross sectional studies. Asia Pac J Clin Nutr 16: 462–466.
2. Janssen I, Katzmarzyk PT, Boyce WF, Vereecken C, Mulvihill C, et al. (2005) Comparison of overweight and obesity prevalence in school-aged youth from 34 countries and their relationships with physical activity and dietary patterns. Obes Rev 6: 123–132.
3. Westergren A, Lindholm C, Axelsson C, Ulander K (2008) Prevalence of eating difficulties and malnutrition among persons within hospital care and special accommodations. J Nutr Health Aging 12: 39–43.
4. Russell CA, Elia M on behalf of BAPEN and collaborators: Nutrition screening survey in the UK in 2007. Nutrition screening survey and audit of adults on admission to hospitals, care homes and mental health units. BAPEN, 2007.
5. Swallen KC, Reither EN, Haas SA, Meier AM (2005) Overweight, obesity, and health-related quality of life among adolescents: the National Longitudinal Study of Adolescent Health. Pediatrics 115: 340–347.
6. Kruizenga HM, Wierdsma NJ, van Bokhorst MA, de van der Schueren , Hollander HJ, et al. (2003) Screening of nutritional status in The Netherlands. Clin Nutr 22: 147–152.
7. Pirlich M, Schütz T, Norman K, Gastell S, Lübke HJ, et al. (2006). The German hospital malnutrition study. Clin Nutr 25: 563–572.
8. Planas M, Audivert S, Pérez-Portabella C, Burgos R, Puiggrós C, et al. (2004) Nutritional status among adult patients admitted to an university-affiliated hospital in Spain at the time of genoma. Clin Nutr 23: 1016–1024.
9. WHO report, Puska P, Nishida C, Porter D (2006) Obesity and overweight.
10. WHO, Dini L (2006) Strategic directions for improving nutritional status of populations using the lifecycle approach. Assignment Report. SEA-NUT-167.
11. Hossain P, Kawar B, and El Nahas M (2007) Obesity and Diabetes in the Developing World – A Growing Challenge. N Engl J Med 356: 213–215.
12. Al-Khateeb BF, AL-Gelban KS (2008) Dietary habits in a Suburban Saudi Community. Biomed Res 19: 55–59.
13. Amin TT, Al-Sultan AI, Ali A (2008) Overweight and obesity and their relation to dietary habits and socio-demographic characteristics among male primary school children in Al-Hassa, Kingdom of Saudi Arabia. Eur J Nutr 47: 310–318.
14. Al-Othaimeen AI, Al-Nozha M, Osman AK (2007) Obesity: an emerging problem in Saudi Arabia: Analysis of data from the National Nutrition Survey. East Mediterr Health J 13: 441–448.
15. Al-Nuaim AR, al-Rubeaan K, al-Mazrou Y, al-Attas O, al-Daghari N, et al. (1996) High prevalence of overweight and obesity in Saudi Arabia. Int J Obes Relat Metab Disord 20: 547–552.
16. Al-Almaie SM (2005) Prevalence of obesity and overweight among Saudi adolescents in Eastern Saudi Arabia. Saudi Med J 26: 607–611.
17. Madani KN (2000) Obesity in Saudi Arabia. Bahrain Med Bull 22 : 1–9.
18. Al-Nuaim AA, Bamgboye EA, Al-Rubeaan KA and Al-Mazrou Y (1997) Overweight and Obesity in Saudi Arabian Adult Population, Role of Sociodemographic Variables. J Community Health 22: 211–223.
19. Baslaim G, Bashore J, Alhoroub K (2008) Impact of Obesity on Early Outcomes after Cardiac Surgery: Experience in a Saudi Arabian Center. Ann Thorac Cardiovasc Surg 14: 369–375.
20. Al-Nozha MM, Al-Hazzaa HM, Arafah MR, Al-Khadra A, Al-Mazrou YY, et al. (2007) Prevalence of physical activity and inactivity among Saudis aged 30–70 years. A population-based cross-sectional study. Saudi Med J 28 : 559–568.
21. Al-Hazzaa HM (2004) Prevalence of physical inactivity in Saudi Arabia: a brief review. East Mediterr Health J 10: 663–670.
22. El-Hazmi MA, Warsy AS (2000) Prevalence of overweight and obesity in diabetic and non-diabetic Saudis. East Mediterr Health J 6: 276–282.
23. Warsy AS, el-Hazmi MA (1999) Diabetes mellitus, hypertension and obesity – common multifactorial disorders in Saudis. East Mediterr Health J 5: 1236–1242.
24. Al-Baghli NA, Al-Ghamdi AJ, Al-Turki KA, El-Zubaier AG, Al-Ameer MM, et al. (2008) Overweight and obesity in the eastern province of Saudi Arabia. Saudi Med J 29: 1319–1325.
25. Westergren A, Torfadóttir Ó, Ulander K, Axelsson C, Lindholm C (2010) Malnutrition prevalence and the precision in nutritional care – an intervention study in one teaching hospital in Iceland. J Clin Nurs 19: 1830–1837.
26. Abahussain NA, Musaiger AO, Nicholls PJ, Stevens R (1999) Nutritional status of adolescent girls in the Eastern Province of Saudi Arabia. Nutr Health 13: 171–177.
27. Alhamdan AA (2004) Nutritional status of Saudi males living in the Riyadh nursing home. Asia Pac J Clin Nutr 13: 372–376.
28. Westergren A, Lindholm C, Mattsson A, Ulander K (2009) Minimal Eating Observation Form: Reliability and Validity. J Nutr Health Aging 13: 6–12.
29. Westergren A, Wann-Hansson C, Börgdal EB, Sjölander J, Strömblad R, et al. (2009) Malnutrition prevalence and precision in nutritional care differed in relation to hospital volume – a cross-sectional survey. Nutr J 8:20.
30. Polit DF, Beck CT, Hungler BP (2001) Essentials of Nursing Research: Methods, Appraisal and Utilization. Lippincott Williams & Wilkins.
31. SWESPEN (Swedish Society for Clinical Nutrition and Metabolism) (2006) Dietisternas Riksförbund, Nutritionsnätet för Sjuksköterskor och Svensk Förening för Klinisk Nutrition. Nutritionsbehandling i sjukvård och omsorg.
32. Kondrup J, Rasmussen HH, Hamberg O, Stanga Z, AN AD HOC ESPEN Working Group (2003) Nutritional risk screening (NRS 2002): a new method based on an analysis of controlled clinical trials. Clin Nutr 22 : 321–336.
33. Hansen T, Kjaersgaard A, Faber J (2011) Measuring elderly dysphagic patients' performance in eating? A review. Disabil Rehabil 33: 1931–1940.
34. Almajwal AM, Al-Baghli NA, Batterham MJ, Williams PG, Al-Turki KA, et al. (2009) Performance of body mass index in predicting diabetes and hypertension in the Eastern Province of Saudi Arabia. Ann Saudi Med 29: 437–445.
35. WHO/IASO/IOTF (2000). The Asia-Pacific perspective: redefining obesity and its treatment. Health Communications Australia: Melbourne.
36. WHO, Helsinki Declaration.

37. Altman DG (1991) Practical statistics for medical research. London: Chapman and Hall.

38. Pernicka E, Bauer P, Mouhieddine M, Schuh C, Schindler K, et al. (2009) Selection bias in cross-sectional studies: Length bias in the nutritionDay study. Abstracts of the 31st ESPEN Congress, Vienna.

39. Al-Subaihi A A (2008) Comparison of Web and Telephone Survey Response Rates in Saudi Arabia. The Electronic Journal of Business Research Methods 6: 123 – 132.

40. Schindler K, Pernicka E, Laviano A, Howard P, Schutz T, et al. (2010) How nutritional risk is assessed and managed in European hospitals: A survey of 21,007 patients findings from 2007–2008 cross-sectional nutritionDay survey. Clin Nutr 29: 552-559.

41. Fukushima R, Ohyanagi H, Yamaguchi K, Ikeda K, Koyama Y, et al. (2009) Nutritionday project in Japan: Comparison of nutrition care and nutritional status of hospitalized patients in Japan and in Europe. ESPEN Conference, Vienna.

42. Khalaf A, Berggren V, Westergren A (2009) Caring for undernourished patients in an orthopedic setting. Nurs Ethics 16: 5–18.

43. Amer MS, Mousa SM, Abdel Rahman TT, Saber HG (2009) Malnutrition and its risk factors in nursing home residents in Cairo. J Am Geriatr Soc 57: 1716–1718.

44. Bagchi K (2008) Nutrition in the Eastern Mediterranean Region of the World Health Organisation. East Mediterr Health J 14: S107–S113.

45. Atinmo T, Mirmiran P, Oyewole OE, Belahsen R, Serra-Majem L (2009) Breaking the poverty/malnutrition cycle in Africa and the Middle East. Nutr Rev 67: S40–S46.