

Original Article

The nutritional status of adult female patients with disabilities in Kuwait

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المخلص

أهداف البحث: البالغون ذوو الإعاقة معرضون لخطورة عالية لسوء التغذية مقارنة بنظرائهم من غير المعوقين، بسبب مشاكل التغذية والظروف الطبية المرتبطة بحالاتهم. قمنا بتقييم انتشار سوء التغذية لمجموعة من السيدات النزليات في مركز إعادة تأهيل، وتم التحقق من صعوبات التغذية، والمشاكل الطبية ذات الصلة بالتغذية.

طرق البحث: هذه الدراسة استخدمت نسختين لتقييم الغذائي المصغر- النموذج القصير (MNA-SF) لفحص سوء التغذية؛ التقييم الغذائي المصغر- النموذج القصير الأول المصغر لتقييم التغذية (MNA-SF1) عن مؤشر كتلة الجسم والنموذج القصير الثاني المصغر لتقييم التغذية (MNA-SF2) كطريقة بديلة بقياس محيط الساق. تم جمع البيانات من 53 سيدة تعاني من إعاقات ذهنية وبدنية في دراسة مستعرضة لنزليات مركز إعادة التأهيل بالكويت.

النتائج: من بين جميع المشاركات، تبين أن 63.5% يعانين من زيادة الوزن أو السمنة، بينما تعاني 11.5% من نقص الوزن. باستخدام النموذج القصير الأول المصغر لتقييم التغذية وجد أن 57.7% في خطر الإصابة بسوء التغذية بينما 11.5% يعانين من سوء التغذية. تم التعرف على مزيد من المرضى المعرضين لخطر سوء التغذية أو في الواقع يعانين من سوء التغذية باستخدام النموذج القصير الثاني المصغر لتقييم التغذية (6.9% و 23.1%، على التوالي). من مشاكل التغذية التي ذكرت صعوبة الحفاظ على وضعية الجلوس، والإمساك بالطعام على الصحن، ووضع الطعام في الفم، والبلع. وزاد وجود العدوى الأمر سوءاً للإندثار بسوء التغذية بغض النظر عن حالة أوزانهم.

الاستنتاجات: تشير نتائج الدراسة بأن النموذج القصير الثاني المصغر لتقييم التغذية أكثر فعالية للتعرف على سوء التغذية. ويمكن للسمنة أن تحجب تحديد

مرضى سوء التغذية إذا اعتمد الطبيب فقط على استخدام النموذج القصير الأول المصغر لتقييم التغذية الذي يعتمد على مؤشر كتلة الجسم.

الكلمات المفتاحية: البالغين ذوي الإعاقة؛ مؤشر كتلة الجسم؛ العادات الغذائية؛ المجتمع الكويتي؛ السمنة؛ الحالة الغذائية

Abstract

Objectives: Adults with disabilities are at a higher risk of malnutrition than are their non-disabled counterparts owing to feeding problems and associated medical conditions. We evaluated the prevalence of malnutrition in a group of institutionalized women and investigated any feeding difficulties and nutrition-related medical problems.

Methods: This study used two versions of the Mini Nutritional Assessment-Short Form (MNA-SF) to screen malnutrition: the MNA-SF1 which uses the body mass index, and the MNA-SF2 which uses the calf circumference. Data were collected from 53 women with intellectual and physical disabilities in a cross-sectional survey of residents of the Kuwait Rehabilitation Centre.

Results: Of all participants, 63.5% were found to be overweight or obese, while 11.5% were underweight. Using the MNA-SF1, 57.7% were found to be at risk of malnourishment while 11.5% were malnourished. More patients were identified to be at risk of malnutrition or to be actually malnourished using the MNA-SF2 (59.6% and 23.1%, respectively). Reported feeding problems included difficulties in maintaining a sitting position, manipulating food on a plate, conveying food to the mouth, and in swallowing. The presence of infections worsened the prognoses of malnourished women regardless of their weight status.

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Conclusions: Our findings suggest that MNA-SF2 is a more sensitive tool for identifying malnourishment than MNA-SF1. Obesity can obscure the identification of malnourished patients if clinicians rely solely on the MNA-SF1, which uses the body mass index.

Keywords: Adults with disabilities; Body mass index; Dietary habits; Kuwaiti society; Nutritional status; Obesity

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Introduction

Disability and malnutrition are closely linked, and both are reportedly common among institutionalized adults. Several studies have found that nutritional care is neglected in people with disabilities.¹ Individuals with disabilities require greater nutritional attention due to feeding problems and other physical and mental limitations that impede their food intake.² Dysphagia, aspiration, pneumonia, respiratory disease, and choking cause mortality in individuals with intellectual disabilities more often than they do in the general population.³ Individuals with intellectual disabilities are at increased risk of being underweight or of being obese.⁴ Timely recognition of nutritional problems facilitates providing cost-effective management, including both nutritional interventions and medical treatments, for this population group. Proper nutritional screening can also promote health maintenance and reduce the risk and cost of comorbidities and complications.

The complexities of handling patients with disabilities often present challenges to dietitians in providing adequate nutritional care. Nutritional negligence is linked to deteriorating health status and a concomitant increase in health costs, as the lack of nutritional evaluation and monitoring may worsen patient health status and aggravate medical symptoms. Identifying practical tools for the assessment of nutritional status is crucial for establishing an active role for dietitians working with intellectually disabled adults. Such tools are critical for the patient's nutritional care process, as they can lead to the development of a systematic approach to assess, monitor, and manage nutritional problems.

The Mini Nutritional Assessment-Short Form (MNA-SF) has previously been used in adults with intellectual disabilities as a routine non-invasive screening tool for under- and over-nutrition.⁵ This tool has the potential to be adopted in Kuwait as an effective means of nutritional screening and assessment of nutritional care in adults with intellectual disabilities. The objectives of this study, which was performed in women with intellectual disabilities, were to: (a) examine the appropriateness of using the MNA-SF for evaluating patients' nutritional status; and (b) identify dietary and feeding problems related to the nutritional status of these patients.

Materials and Methods

Study subjects

In Kuwait, the Ministry of Social Affairs and Labour is responsible for providing care for people with mental/intellectual and physical disabilities. The Ministry oversees Kuwait's Rehabilitation Centre, which comprises three departments: The Medical Centre, Disabilities Administration, and Rehabilitation Centre. Based on the latest (November 2015) report by the Centre's administration, there were 73, 96, and 26 patients with physical, intellectual, and sensory disabilities, respectively, of varying severities. The patients' ages ranged from 31 to 65 years, with an average length of institutional stay of 15 years. Most mental and intellectual disabilities were reported to be severe and profound, based on diagnostic tests performed by specialists and physicians during admission. The mobility of patients varied greatly; most patients were bedridden, while others used wheelchairs or assistive devices to allow folding of the lower body. The bedridden patients presented with severely debilitating ailments such as cerebral palsy, epilepsy, severe intellectual disability, spastic quadriplegia, or blindness. Virtually all patients required mealtime assistance and permanent 24-h domestic assistance for cleaning, bathing, and other daily living practices. Each ward was assigned to an attending physician, who was responsible for the medical care and supervision of all the residents. A dietitian was included in the care team, and supervised kitchen-side meal preparation.

Access to patients, permissions, and ethics

The Rehabilitation Centre's administrators, who are the legally authorized representatives of the patients, approved our access to the patients and their medical files. The administrators approved the study protocol and participated willingly in the study; they also provided written informed consent. This study was performed in accordance with the principles established by the Declaration of Helsinki. There was no direct contact between the patients and the research team. All patient information was coded and handled professionally and confidentially for the purposes of this research study. Ethical approval and human subjects' consent were also obtained from the Health Sciences Centre Ethical Committee at Kuwait University (VDR/EC/3142).

Study design and population

This cross-sectional study utilized a descriptive survey, and participants included all of the institutionalized female adults with mental, intellectual, or physical disabilities who reside at the Kuwait Rehabilitation Centre ($N = 53$). Only women were targeted for this pilot study to assess the feasibility of performing a future larger-scale survey. The study was conducted between February 14 and March 15, 2016. A thorough review of the patients' files was performed to gather the most recent data recorded during the time-frame of the pilot study. All data were extracted from patient files, and included the diagnosis, method of mobility,

latest clinical examinations, and routine biochemical parameters such as high-sensitivity C-reactive protein (hs-CRP), serum albumin, and serum vitamin D levels. Nutritional information regarding the processes, problems, types, and conditions related to feeding were collected for each patient by the attending nurse and were also obtained from the attending physician's filed notes. The attending nurse collected any additional details required for the completion of the study, including the knee height and calf circumference (CC) of each patient. The physicians routinely performed a skilled assessment and review of eating and swallowing abilities for the purpose of prescribing appropriate nutritional support.

Nutritional screening and assessment

The MNA is of proven reliability and is accepted worldwide as an effective, simple tool for nutritional screening.⁶ The MNA-SF is a revised screening form that exhibits good consistency in aiding a full-scale evaluation of nutritional status and may also be used to predicting mortality risk in a large elderly population sample.⁷ The MNA-SF relies on six questions (scored 0–3) related to appetite, weight loss, mobility, recent illness/stress, dementia/depression, and body mass index (BMI). The maximum possible screening score is 14 points; this score distinguishes between patients with adequate nutritional status (12–14 points), those at risk of malnutrition (8–11 points), and those who are malnourished (0–7 points). As previously proposed, the CC can be substituted for BMI if weight and height data are not available.^{8,9} Each patient was scored using the MNA-SF1 as well as using an alternative version, the MNA-SF2, which replaces BMI with CC. Thus, the MNA-SF2 requires no weight or height measurements. The attending nurse followed established procedures for obtaining all the anthropometric measurements, i.e., weight, height, and CC.

Statistical analysis

Descriptive statistics are provided as means (standard deviation (SD)) for continuous variables. All variables are expressed as percentages of the study population. Furthermore, prevalence estimates of each MNA-SF category related to feeding and dietary problem variables were compared using the Pearson's chi-square (X^2) test. Fisher's exact tests were used whenever 20% of the expected cell frequencies were ≤ 5 ; p -values $< .05$ were considered significant. Analyses were performed using the SPSS software (version 22) for Windows (SPSS Inc., Chicago, IL, USA).

Results

Participant characteristics

Sixty-four women were initially screened; however, only 53 provided complete data and could be included; 11 subjects were not able to provide all the requisite information in the MNA-SF. The baseline characteristics of the 53 patients are summarized in Table 1. The average age was 44.9 ± 9.1 years, and the average length of stay was 13.7 years. Most patients (82.5%, $n = 44$) were Kuwaiti; non-Kuwaiti patients (17.5%) included Saudi, Omani, Iraqi, and Jordanian nationals. The major diagnoses were cerebral palsy (56.6%, $n = 30$), severe intellectual disability (33.9%, $n = 18$), epilepsy (54.7%, $n = 29$), and Down syndrome (3.8%, $n = 2$). Secondary diagnoses that were reported included blindness ($n = 2$), spastic quadriplegia ($n = 16$), glucose-6-phosphate dehydrogenase deficiency ($n = 5$), diabetes ($n = 5$), dyslipidemia, ($n = 5$), and hypothyroidism ($n = 5$). Many patients were identified to be at a high risk of hip fracture, while 33.3% ($n = 19$) were menopausal, 62.3% ($n = 33$) had osteoporosis, and 28.3% ($n = 15$) had osteopenia.

Table 1: Participant characteristics as graded and categorized by MNA-SF1 and MNA-SF2.

	Total	MNA-SF1			MNA-SF2		
	N = 53	Normal (12–14) N = 15	At Risk (8–11) N = 30	Malnourished (0–7) N = 8	Normal (12–14) N = 10	At Risk (8–11) N = 25	Malnourished (0–7) N = 17
Age (years)	44.91 \pm 9.06	45.40 \pm 7.21	46.17 \pm 9.67	38.00 \pm 8.03	44.40 \pm 7.81	46.20 \pm 10.36	43.113 \pm 8.08
Height, cm	140.43 \pm 11.98	136.68 \pm 12.61 ($n = 14$)	140.79 \pm 11.76 ($n = 29$)	145.84 \pm 10.68	140.06 \pm 12.74	140.86 \pm 10.56	140.43 \pm 14.12
Weight, kg	55.13 \pm 19.13	68.09 ^{***a} \pm 17.32	52.99 ^b \pm 17.26	39.78 ^b \pm 13.88	75.03 ^{***a} \pm 16.65	48.07 ^b \pm 14.73	56.99 ^b \pm 16.19
BMI, Kg/m ²	27.58 \pm 8.28	35.40 ^{***a} \pm 4.75 ($n = 14$)	26.28 ^b \pm 7.17	18.58 ^c \pm 5.46	37.41 ^{***a} \pm 4.44 ($n = 12$)	25.56 ^b \pm 7.06	25.35 ^b \pm 7.96
CC, cm (≥ 31 cm)	28.54 \pm 6.89	33.93 ^{***a} \pm 4.96	26.93 ^b \pm 6.47	24.25 ^b \pm 5.95	36.45 ^{***a} \pm 4.11	28.22 ^b \pm 6.56	24.34 ^b \pm 4.40
Albumin, N = 52 [35–52 mg/dL]	34.38 \pm 3.22	33.68 \pm 4.18	34.23 \pm 2.53	36.26 \pm 3.24	32.92 \pm 4.91	34.84 \pm 2.36	34.58 \pm 3.19
Hs-CRP, mg/L N = 15 [0–8 mg/L]	35.37 \pm 54.29	6.09 \pm 3.50 ($n = 2$)	27.73 \pm 64.43 ($n = 10$)	40.30 \pm 25.64 ($n = 4$)	6.09 \pm 3.50 ($n = 3$)	22.67 \pm 30.40 ($n = 12$)	54.63 \pm 72.29 ($n = 7$)
Vitamin D, N = 33 [75–250 nmol/L]	102.05 \pm 53.34	115.34 \pm 41.83 ($n = 6$)	104.03 \pm 59.38 ($n = 23$)	77.05 \pm 28.78 ($n = 4$)	119.44 ^{a**} \pm 45.40 ($n = 6$)	99.66 ^b \pm 29.64 ($n = 25$)	98.54 ^c \pm 72.38 ($n = 2$)
MNA-SF1 score	9.79 \pm 2.14	12.20 ^{***} \pm .56	9.57 ^b \pm .5	6.12 ^c \pm 1.46	12.30 \pm .67	10.04 \pm 1.40	8.00 \pm 2.06
MNA-SF2 score	8.88 \pm 2.39	11.20 ^{a**} \pm 1.70	8.14 ^b \pm 1.36	6.13 ^c \pm 2.03	12.30 ^{a**} \pm .67	8.92 ^b \pm .81	6.29 ^c \pm 1.31

Note. Each superscript letter denotes a subset of the three MNA groups (within version) whose proportions did not differ significantly between groups, at $p < .05$. BMI, body mass index; CC, calf circumference; Hs-CRP, high-sensitivity C-reactive protein; MNA-SF, Mini Nutritional Assessment-Short Form.

Nutritional status and the MNA-SF

The mean BMI of subjects with complete data ($n = 53$) was 27.58 ± 8.28 , indicating an overweight status (Table 1). Most patients were overweight or obese (15.4%, $n = 8$; 48.1%, $n = 25$, respectively). Normal weight was observed in 25.0% of the patients ($n = 13$), and 11.5% ($n = 6$) were underweight.

Using the MNA-SF1 grading system, we identified 30 subjects (57.7%) who were at risk of malnourishment, and 6 (11.5%) who were malnourished. When using the MNA-SF2, however, we found that 31 subjects (59.6%) were at

risk for malnourishment, while 12 (23.1%) were malnourished. Lower mean BMIs and CCs were observed in patients who were identified as malnourished and at risk of malnutrition versus those with adequate nutrition (Table 1). Being at risk for malnourishment was associated with all weight categories, and actual malnourishment was identified only among underweight and normal-weight patients when assessed using the MNA-SF1 (Figure 1A). Based on the MNA-SF2, more patients were deemed to be malnourished across all weight categories, including among obese patients. All patients identified as having normal nutritional status were obese (Figure 1B).

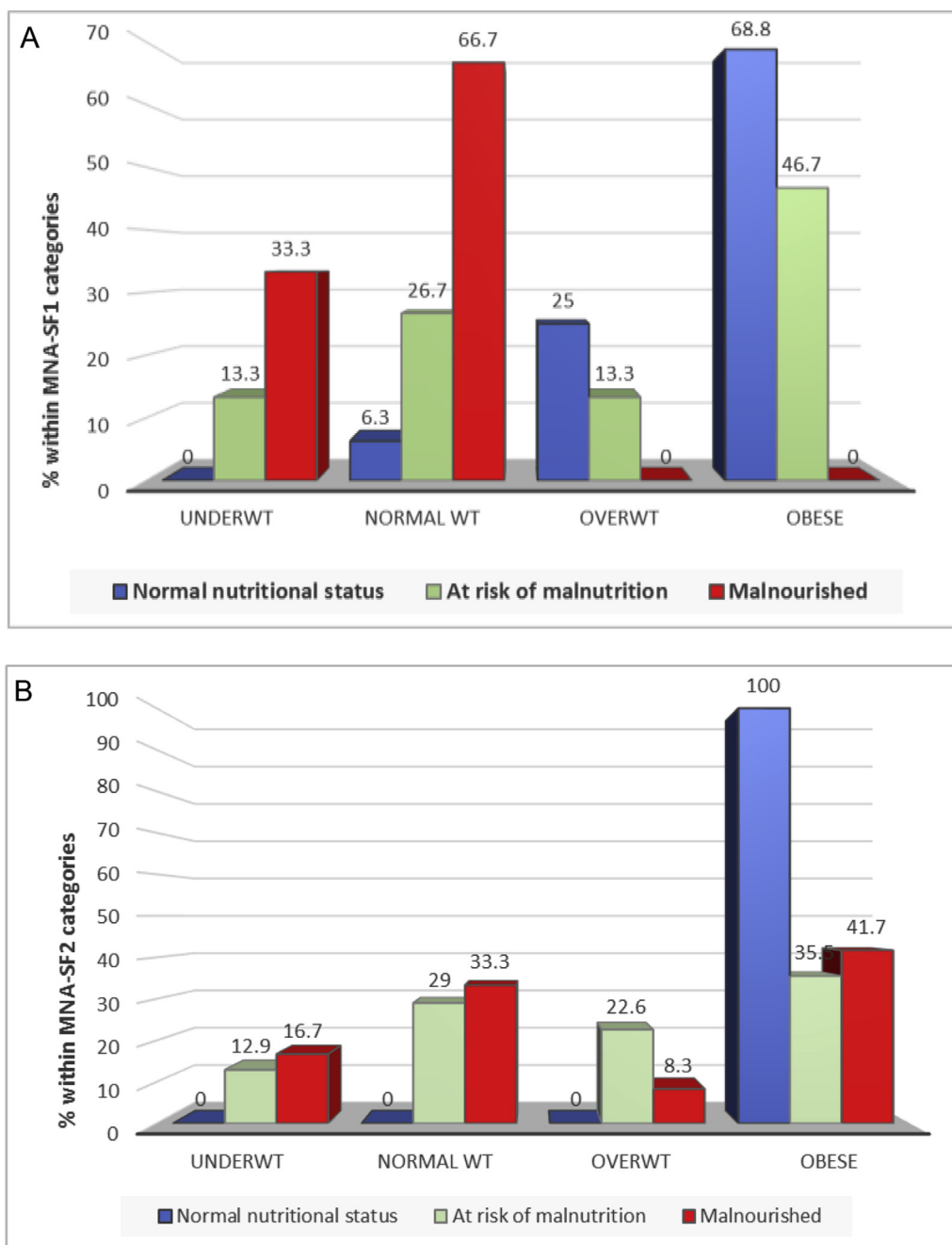


Figure 1: Distribution of weight categories according to nutritional status as determined by A. the Mini Nutritional Assessment-Short Form (MNA-SF)-1 versus B. the MNA-SF2.

The use of both the MNA-SF1 and MNA-SF2 was positively associated with BMI ($r = .752, p < .001$; $r = .610, p < .001$) and with CC ($r = .472, p < .001$; $r = .636, p < .001$). Nevertheless, when using MNA-SF1 scores, we determined that the mean CC for 43.8% of the normal patients was lower than the cut-off value used for healthy nourished adults (<31 cm) (Figure 2A). However, all patients with CCs below this cut-off value were correctly identified as either at risk of malnourishment or as malnourished (Figure 2B).

Patients with available hs-CRP data ($n = 16$) showed a high mean level of this protein (35.4 ± 54.3 mg/L), indicating the presence of infections (chest infections were noted in the files). Eight of these patients were identified as malnourished

using the MNA-SF2, whereas only four were malnourished according to the MNA-SF1. Albumin was negatively associated with the MNA-SF1 ($r = -.457, p = .015$) and was not associated with the MNA-SF2.

Feeding- and dietary-related domains

A majority of patients were reported to be bed- or chair-bound (54.4%, $n = 31$) and to have feeding problems, including difficulty with maintaining a sitting position (50.9%, $n = 29$), manipulating food on a plate (15.8%, $n = 9$), and conveying food to the mouth (17.5%, $n = 10$).

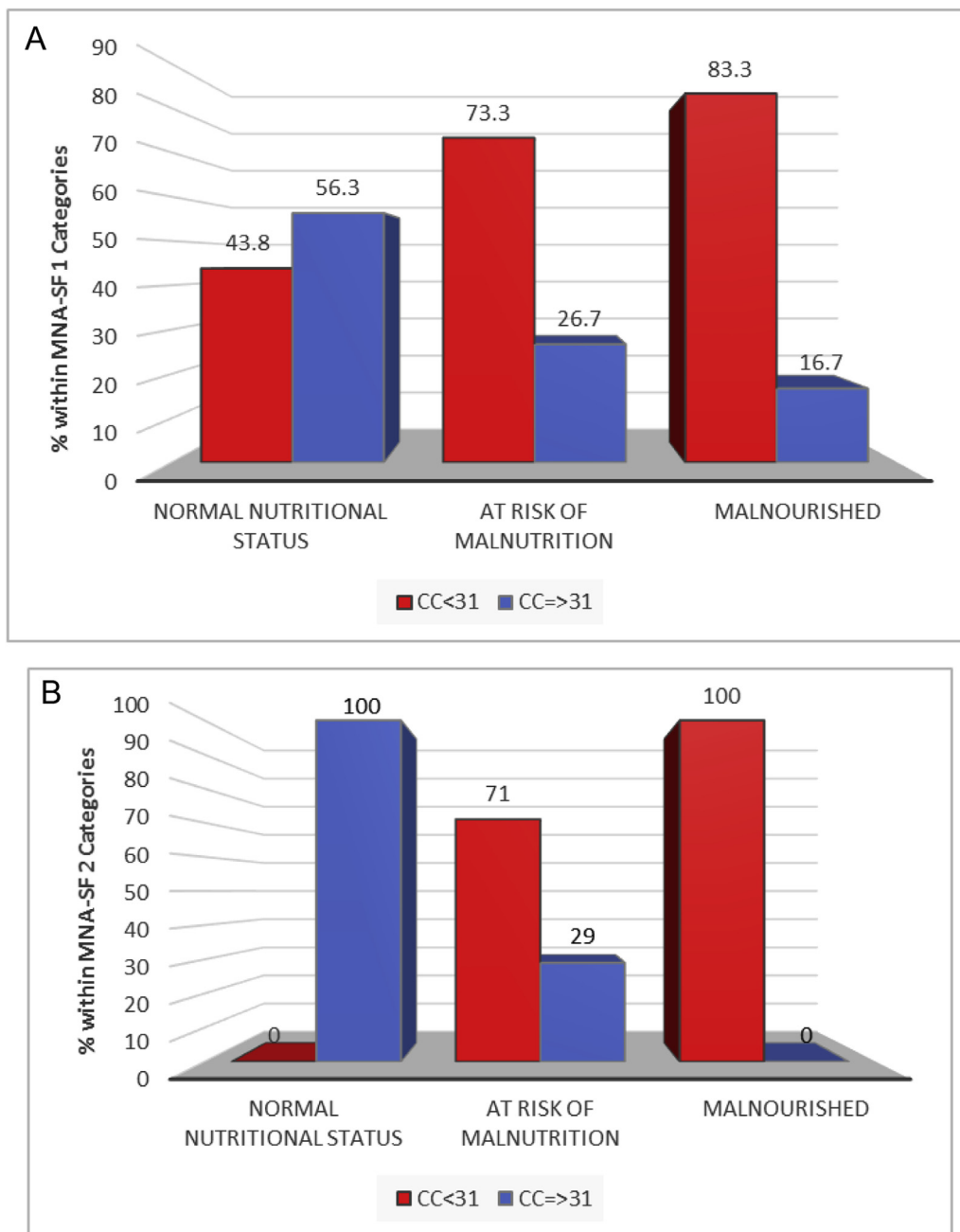


Figure 2: Distribution by calf circumference (CC) per A. the Mini Nutritional Assessment-Short Form (MNA-SF)-1 and B. the MNA-SF2 categorization.

Oral control problems included difficulty chewing (10.5%, $n = 6$), coping with food in the mouth (14%, $n = 8$), and difficulty swallowing (45.6%, $n = 26$). A majority of the patients followed a normal diet (73.7%, $n = 42$), whereas 21.1% ($n = 12$) were fed a soft diet and 5.3% ($n = 3$) subsisted on a liquid diet. Most patients were reported to have constipation (82.4%, $n = 47$) and were prescribed laxatives. Only one patient, who had no teeth, was reported to have a lack of energy and appetite. Most patients required full feeding support during mealtimes (80.7%, $n = 46$). Many subjects received *Ensure* supplements twice daily ($n = 35$) as well as calcium with vitamin D ($n = 34$) and B-vitamin ($n = 8$) supplements. According to MNA-SF scoring, the distribution of the dietary and feeding variables did not vary significantly when compared between normal and nutritionally at-risk groups. Exceptions were variables among BMI categories, mobility, presence of acute infection, being on a liquid diet, and severity of mental retardation which varied between groups (Tables 2 and 3).

Discussion

Screening for the risk of malnutrition among various institutionalized populations has received growing interest.¹⁰ Malnutrition in patients with disabilities is a critical issue, as it is associated with increased risk of comorbidities and mortality. To our knowledge, this is the first study in

Kuwait to investigate the nutritional status of female patients with disabilities. A high proportion of individuals with overweight and obesity was observed in our sample population of female residents with intellectual and physical disabilities at the Rehabilitation Centre.

In our study, a large proportion of women with disabilities were identified as being at risk of malnourishment using the MNA-SF tool, and better nutritional status was associated with a higher BMI. Conversely, patients who were overweight and obese, or those who were underweight or extremely underweight, were identified as being at risk of malnutrition. This polarization of weight distribution due to feeding and dietary difficulties has been observed in several studies among populations with disabilities.¹¹ Since these patients require complete mealtime assistance, poor dietary intake could be caused by insufficient staffing to support carefully paced food consumption. Patients with obesity are more challenging, as there are many perceived difficulties in managing weight-reduction programs for patients with disabilities and in dealing with patients with overweight. Without proper management and monitoring, institutionalized adults can be overfed and over-supplemented. Moreover, professional dietetic weight management services to deal with patients with disabilities are usually not available locally.

Previous research has demonstrated the consistency of both the MNA-SF1 and MNA-SF2, which compare well

Table 2: Mini Nutritional Assessment-Short Form (MNA-SF) items as per categories of nutritional status using both MNA-SF1/MNA-SF2.

Screening Criteria Using the Mini Nutritional Assessment-Short Form (MNA-SF1/MNA-SF2)					
Screening item	Scoring	Total n (%)	Normal (12–14)	At risk (8–11)	Malnourished (0–7)
(A) Food intake declined in the past 3 months owing to loss of appetite, digestive problems, chewing, or swallowing difficulties	0 = severe decrease in food intake	1 (1.9)	0/0	0/0	1/1
	1 = moderate decrease in food intake	1 (1.9)	0/0	1/1	0/0
	2 = no decrease in food intake	51 (96.2)	15/10	29/24	7/16
(B) Weight loss during the last 3 months	0 = weight loss greater than 3 kg	2 (3.8)	0/0	1/1	1/1
	1 = does not know	1 (1.9)	0/0	1/0	0/1
	2 = weight loss between 1 and 3 kg	9 (17.0)	0/0	5/6	4/3
	3 = no weight loss	41 (77.4)	15/10	23/18	3/12
(C) Mobility	0 = bed or chair bound	45 (84.9)	13/8	24/20	8/16
	1 = able to get out of bed/chair but does not go out	7 (13.2)	1/1	6/5	0/2
	2 = goes out	1 (1.9)	1/1	0/0	0/0
(D) Psychological stress or acute disease in the past 3 months	0 = yes	12 (22.6)	0/0	8/4	4/7
	2 = no	41 (77.4)	15/10	22/21	4/10
(E) Neuropsychological problems or degree of mental retardation	0 = severe mental retardation, or dementia	18 (34.6)	0/0	13/7	5/11
	1 = mild to moderate mental retardation or dementia	15 (28.8)	5/5	9/9	2/1
	2 = no mental retardation or dementia	19 (36.5)	11/4	8/15	0/0
(F1) For MNA-SF1 only, body mass index	0 = BMI less than 19	9 (17.0)	0	5	4
	1 = BMI 19 to less than 21	8 (15.1)	0	5	3
	2 = BMI 21 to less than 23	3 (5.7)	0	3	0
	3 = BMI 23 or greater	33 (62.3)	15	17	1
(F2) For MNA-SF2 only, calf circumference	0 = CC less than 31 cm	34 (65.4)	0	18	16
	3 = CC 31 cm or greater	19 (34.6)	10	7	1

Note. Bolded fonts for observations that at least doubled when using MNA-SF2 versus MNA-SF1. BMI, body mass index; CC, calf circumference; MNA-SF, Mini Nutritional Assessment-Short Form.

Table 3: Dietary-related domains of female residents of the Rehabilitation Centre (N = 53), according to nutritional status determined by MNA-SF1/MNA-SF2.

Domain	Condition	Total n (%)	Normal (12/14)	At risk (8–11)	Malnourished (0–7)
Classes of BMI according to the CDC	Underweight	6 (11.5)	0/0	4/4	2/2
	Normal weight	13 (25.0)	0/0	8/7	5/6
	Overweight	8 (15.4)	3/0	5/7	0/1
	Obese	25 (48.1)	12/10	12/7	1/8
Main diagnosis	Severe mental retardation	18 (33.9)	0/0	13/7	5/11
	Epilepsy	29 (54.7)	5/4	16/7	5/10
	Cerebral Palsy	30 (56.6)	10/7	16/12	5/12
	Down Syndrome	2 (5.7)	0/0	1/1	0/1
Diet type	Normal diet	38 (73.3)	13/10	22/18	3/9
	Soft diet	12 (21.1)	2/0	6/7	4/5
	Fluid diet	3 (5.3)	0/0	2/0	1/3
Gastro-intestinal problems	Constipation	45 (82.4)	11/6	26/23	8/16
	Diarrhea	0	0/0	0/0	0/0
	GERD	2 (3.5)	1/1	0/0	1/1
	None	8 (14.0)	4/4	4/2	0/1
Swallowing or mouth problems	Difficulty chewing	6 (10.5)	1/0	3/3	2/3
	Difficulty coping foods in mouth	8 (14.0)	4/1	4/5	0/2
	Difficulty swallowing	24 (45.6)	3/2	15/11	6/11
	None	15 (29.8)	7/7	8/6	0/1
Energy or appetite problems	Lack of energy to complete entire meal	1 (3.5)	0/0	1/1	0/0
	Poor appetite	2 (5.3)	0/0	1/1	1/1
	Aberrant eating speed	1 (3.5)	1/1	0/0	0/0
	None	49 (85.9)	14/9	28/24	7/16
Feeding problems	Maintaining sitting position	28 (50.9)	5/0	16/15	7/13
	Manipulating food on plate	8 (15.8)	2/2	5/4	1/2
	Conveying food to mouth	9 (17.5)	4/4	5/3	0/1
	None	8 (15.8)	4/4	4/3	0/1
Mealtime assistance	Mild support	3 (5.3)	1/1	2/2	0/0
	Moderate support	2 (5.3)	2/2	0/0	0/0
	Full support	44 (80.7)	11/6	25/21	8/16
	No support	4 (8.8)	1/1	3/2	0/1
Orthopedic problems	Contractures	3 (6.8)	2/1	1/2	0/0
	Scoliosis	2 (2.3)	0/0	1/1	1/1
	Osteopenia	15 (31.8)	6/5	9/8	0/2
	Osteoporosis	33 (56.8)	4/2	25/23	4/8
	Dislocated hips	1 (2.3)	0/0	1/0	0/1

Note. Bolded fonts for observations that *at least* doubled when using MNA-SF2 versus MNA-SF1.

BMI, body mass index; CDC, Centers for Disease Control and Prevention; GERD, gastroesophageal reflux disease.

with the full MNA in terms of the accurate rating of participants' nutritional status.⁹ It should be noted, however, that the prevalence rate of malnutrition in our study sample doubled when the MNA-SF2 was used. There was also a slight increase in the number of female residents identified as at risk of malnourishment when using the MNA-SF2 compared to that identified using the MNA-SF1. These observations suggest that the risk of malnutrition can be underestimated for this population when using the MNA-SF1, which relies on BMI.

The present findings are also consistent with earlier observations that suggest that the BMI might not be a sensitive indicator of malnutrition, especially in heavier individuals, regardless of sex.¹² One likely explanation is that changes in body composition as a consequence of malnutrition may not be detectable when using the BMI alone. In this regard, patients can gain fat while simultaneously undergoing muscle loss without a noticeable change in their net body weight. Furthermore, fluctuations in BMI may be related

to fluid and electrolyte retention, leading to the overestimation of the measured body weight.¹³ Utilizing the CC instead of the BMI in the MNA tool can also alleviate the burden of weighing patients with limited mobility. Moreover, the CC may more accurately reflect loss of lean body mass, and the CC also decreases proportionately with inflammation.¹⁴ A recent study found that CC percentiles are better at predicting emerging care needs in older Taiwanese individuals than are BMI percentiles.¹⁵ Therefore, the application of CC for predicting emerging care needs deserves further investigation across various nutritionally susceptible populations. In the present study, we did not attempt to evaluate the feasibility of the MNA-SF for nurses or dietitians; hence, this requires future investigation. The information required for the MNA-SF items may be readily available and may be collected easily from files documenting routine tests and measurements. Identifying nutritional risks empowers the nurses, physicians, and dietitians to take

proactive approaches to nutritional care and can help guide decision-making regarding the identified risk of malnutrition. This approach can thus provide documentation toward appropriate assessment, close monitoring, proper intervention, and re-evaluation procedures.

Poor dietary intake and dysphagia can limit caloric consumption and may increase the risk of aspiration of food or liquids (including saliva and stomach contents) into the lungs, resulting in lung infections such as pneumonia.¹⁶ High levels of infection-related inflammation, as identified by high hs-CRP levels, were observed among those identified as malnourished using the MNA-SF2, whereas only four patients were identified as malnourished using the MNA-SF1. Unfortunately, hs-CRP levels were assessed in only a small subset of patients; thus, factors associated with its variation or with the relationships between hs-CRP values, blood albumin concentrations, and malnutrition could not be determined. Such information would be worthwhile to investigate in future studies, particularly because low blood serum albumin concentrations correlate with longer hospital stays and increased mortality.¹⁷ The stress response induced by inflammation and acute infection marked by high levels of hs-CRP would be expected to be associated with low albumin concentrations in the at-risk-for-malnutrition group. In contrast, a negative association was observed between blood serum albumin concentrations and the MNA-SF1 scores in our sample population. It is therefore likely that the protein supplements that many of the patients received prevented deterioration of their blood serum albumin concentrations, despite the high levels of infection. Similarly, a low incidence of low blood serum albumin has been previously noted among adults with intellectual disabilities,¹⁸ which suggests that serum albumin may not be a good indicator of nutritional status in this population due to several factors that reduce its sensitivity, including the relatively long half-life of this biomarker.¹⁹

Constipation was a common gastrointestinal condition in our sample population, which may have been caused by inadequate fluid intake, poor dietary fiber intake, and other factors related to the patients' physical and mental disabilities such as low muscle tone and reduced mobility. Moreover, many medications may affect gut motility, including treatments for hypothyroidism, epilepsy, and infections, causing poor bowel function. Osteoporosis and osteopenia appeared to be common orthopedic conditions in our population; this observation is consistent with previous studies of individuals with severe or multiple disabilities, as such individuals are at increased risks of severe bone mineral depletion due to non-ambulation, inadequate vitamin D metabolism, and hormonal dysfunction.²⁰

Conclusions and recommendations

Our small-scale investigation indicated that the MNA-SF is a rapid and feasible screening tool for identifying patients with disabilities who are at risk of malnourishment. Nevertheless, several limitations ought to be considered. The small sample size from a single facility, as well as the exclusion of males, preclude generalizing our findings. Ideally, the study should have included both the full versions of the MNA as well as a widely accepted and

more robust nutritional indicator other than blood serum albumin (used here as a reference standard). Future studies should include all pertinent biochemical indicators and body composition measures to fully evaluate the nutritional and protein status of patients with disabilities. Evaluation of the risk of metabolic syndrome and heart disease should also be included for patients with disabilities, especially because this population exhibits a high prevalence of overweight and obese individuals. These high rates of obesity should be addressed in evidence-based protocols with interdisciplinary approaches designed for individuals with disabilities that consider age, disease state, body composition, feeding problems, and mobility status.

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Ethics and consent to participate

Ethical approval was obtained from the Health Sciences Ethical Committee, Kuwait University. Human subjects' consents were obtained from Kuwait's Rehabilitation Centre and the residents' legal guardians.

Conflict of interest

The authors have no conflict of interest to declare.

Authors' contributions

DA conceived and designed the study, DA coordinated data collection and entry, performed the statistical analysis, and wrote the manuscript. MZ and TAZ provided assistance with the coordination of the study and commented on drafts of the manuscript. SK advised on the statistical analysis and commented on drafts of the manuscript. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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