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Comparison of Energy and Nutrient Intakes of Individuals with Disabilities According to Reference Values: A Cross-Sectional Study

Engelli Bireylerin Enerji ve Besin Ögesi Alımlarının Referans Değerler ile Kıyaslanması: Kesitsel Bir Çalışma

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Article Information

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ABSTRACT

Aim: The objective is to evaluate the daily intake of energy and nutrients to determine the nutritional status of individuals with disabilities. **Subjects and Method:** The study was carried out under the Disability Support Program in 8 special education, practice and rehabilitation centers in the city center of [removed for blind peer review] as a cross-sectional study. The demographic characteristics, daily energy, and nutrient intake levels of individuals with disabilities were asked to the participants. Daily energy and nutrient intake levels were compared along with recommendations. **Results:** It has been determined that in all age groups the total daily energy intake and energy ratio from carbohydrates were below the reference, and the energy ratio from fat was high. Vitamin A was low in males in the 14-18 age group and high in females in the 19-30 age group. Vitamin B_1 was low in both genders in 10-30 year age group and folate intake was low for people above 10 years. Calcium and magnesium were low in both genders in all age groups. **Conclusion:** It has been determined that disabled people's diet were inadequate and unbalanced, and it was thought that periodic evaluation of nutritional status will play an important role in improving their health.

Keywords: Nutrient requirement, food consumption, disabled individual, macro nutrients, micro nutrients

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ÖZ

Amaç: Bu çalışmada, engelli bireylerin beslenme durumlarını değerlendirmek için günlük enerji ve besin ögesi alımlarının belirlenmesi amaçlanmıştır. **Örneklem ve Yöntem:** Araştırma, Engelli Destek Programı kapsamında [kör hakem değerlendirmesi için kaldırıldı] il merkezindeki 8 özel eğitim, uygulama ve rehabilitasyon merkezinde kesitsel bir çalışma olarak gerçekleştirilmiştir. Engelli bireylerin demografik özellikleri ile günlük enerji ve besin ögesi alım düzeyleri sorgulanmıştır. Günlük enerji ve besin ögesi alım durumları öneriler ile karşılaştırılmıştır. **Bulgular:** Bütün yaş gruplarında engelli bireylerin günlük enerji ve karbonhidratlardan gelen enerji alımlarının, referans alım önerilerinin altında, yağdan gelen enerji oranının ise yüksek olduğu saptanmıştır. 14-18 yaş grubundaki erkeklerde vitamin A alımı düşük, 19-30 yaş grubundaki kadınlarda yüksek bulunmuştur. Her iki cinsiyette de 10-30 yaşta B_1 vitamini, 10 yaş ve üzerinde folat alımı düşük bulunmuştur. Kalsiyum ve magnezyum alımı bütün bireylerin düşüktür. **Sonuç:** Engelli bireylerin beslenme durumlarının yetersiz ve dengesiz oldukları tespit edilmiş, periyodik olarak değerlendirilmelerinin iyileştirme için önemli rol oynayacağı düşünülmüştür.

Anahtar Kelimeler: Besin ögesi gereksinimi, besin tüketimi, engelli birey, makro besin ögeleri, mikro besin ögeleri

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Introduction

Disability has been defined by the World Health Organization as the negative interaction between the health status of the individual (cerebral palsy, down syndrome, depression etc.) and personal, environmental factors (negative attitudes, inability to access public institutions and transport vehicles, limited social support, etc.) and transportation (World Health Organization, 2011); and about 15% of the population of the world has been reported to consist of individuals with disabilities (World Health Organization, 2015). In Turkey, the individuals with disabilities constitute 12.3% of the total population; 2.6% of it are the individuals with orthopedic, visual, hearing, language-speech and mental disabilities while 9.7% were the individuals with chronic diseases (State Institute of Statistics Prime Ministry Republic of Turkey, 2002).

Chronic diseases such as obesity, diabetes, cardiovascular diseases are more common in individuals with disabilities than non-disabled individuals with the same conditions; however, people with disabilities benefit less from preventive health services (Reichard et al., 2011; Havercamp & Scott, 2015). Because the healthcare providers are not aware of this situation and there is no planning for this, effective communication cannot be established with the individuals with disabilities and the general health campaigns often fail to meet the special needs of disabled people. This makes it more difficult for the individuals with disabilities to benefit from health services (Groce et al., 2013).

Nutrition services are included in both preventive and therapeutic health services and ensuring that the individuals with disabilities benefit from the nutritional services plays an important role in improving their quality of life as well as their health conditions. Insufficient and unbalanced nutrition are risk factors for many diseases (Baysal, 2006). Particularly, children and adolescents with disabilities in the age of growth and development need a special and appropriate nutrition plan more than their non-disabled peers do. It has been reported by various researchers that the incidence of nutritional deficiency in children with disabilities is higher than that of non-disabled peers (Kuper et al., 2015; Hume-Nixon & Kuper, 2018). On the other hand, the situation is similar for adults with disabilities. In a study conducted with 53 adult females with mental and physical disabilities, 57.7% of individuals with disabilities were found to have a risk of malnutrition and 11.5% of them had malnutrition (Alkazemi et al., 2018). In another study, it was reported that adults with intellectual disabilities obtained most of their daily energy from only a few meals and that their fruit, vegetable consumptions and pulp intakes were low (Adolfsson et al., 2008).

In this study, it was aimed to evaluate the daily intake of energy and nutrients to determine the nutritional status of individuals with disabilities. It is believed that the study will shed light on extensive studies aimed at creating nutritional references for individuals with disabilities.

Subjects and Method

Place, Time and Sample of the Study

The participants are the individuals with disabilities who were enrolled at all special education, practice and rehabilitation centres (5 private, 3 public) in the city centre of Kirikkale; and it was conducted under the coordination of the Governorship of Kirikkale, with the partnership of Provincial Directorate of National Education and within the context of a project supported by the Ministry of Family and Social Policies. Before data collection, the participants and their parents were informed about the research, and their verbal permissions and written consents were obtained. This study is conducted

following the Helsinki Declaration principles. Necessary permissions were obtained from the Governorship of Kirikkale and the Provincial Directorate of National Education for the study. Besides, permission was obtained from the Social and Humanities Research Ethics Committee at Kirikkale University (protocol number 6-4, dated 2016).

The population of the study consists of 1167 children and adults with disabilities, who were enrolled in the special education practice and rehabilitation institutions in 2016. Since these individuals had different types of disabilities, no sampling selection was made in order to cover all groups, and the entire population was tried to be accessed through the full count method. In the study, the type of disability was classified as "mentally disabled", "physically disabled", "mentally and physically disabled" and "other". “Other” group included the individuals that did not have any mental or physical disabilities but had language and speech disorders, special learning disorders, common developmental disorders, etc. The project was a study with a wide scope that included performing anthropometric measurements and determining the nutrition status of the individuals with disabilities and their families. Therefore, the energy and nutrient intakes of 384 individuals with disabilities (Female: 162, Male: 222), who agreed to participate in this study and whose daily nutritional consumption can be evaluated, were reported in this paper through comparison with reference values.

Assessment of Energy and Nutrient Intakes

Energy and nutrient intakes of individuals with disabilities were obtained using the 24-hour recall food consumption record form. Food consumption records were obtained from the individuals with disabilities in case they were able to respond for themselves; and for those that were not able to respond such as little children, mentally disabled etc., the records were obtained by their parents. The fact that only a single day nutrition consumption of the individuals with disabilities were recorded constitutes a limitation for this study.

Statistical Evaluation of Data

Information obtained were evaluated using the Nutrition Information System Program (Dehne et al., 1999); since there were no specific reference values for the individuals with disabilities, age groups were classified according to the age groups indicated in the Food and Nutrition Guideline Special for Turkey (FNGT) and they were compared with the FNGT reference values obtained according to the gender (Hacettepe University Faculty of Health Sciences Department of Nutrition and Dietetics, 2015). SPSS 23.0 package program (SPSS, 2013) was used for statistical analysis; data were analysed with One Simple T test. The statistical significance level was accepted as $p<0.05$.

Results

Of the 384 disabled people participating in the study, 42.2% were female, 57.8% were male, 83.3% were children and adolescents, and 16.7% were adults. Individuals with disabilities were between the ages of 1-41 and the average age was 12.5 with a ± 7.66 standard deviation. Among the individuals with disabilities, 24.0% were in the mentally disabled group, 49.5% of them were in the physically disabled group, 12.0% of them were in the both mentally and physically disabled group, and 14.5% were in the other disabilities group. Most of the individuals were not literate (54.8%), primary school graduates (16.9%), and only literate (15.6%). 5.5% and 4.9% were secondary and high school graduates respectively. It was identified that 50.0% of the mothers of individuals with disabilities were primary school graduates, 23.4% were high school graduates; 30.5% of the fathers were primary school graduates and 39.1% were high school graduates. Also, 124 parents

(32.3% of them) had consanguineous marriages (Table 1).

Table 1. General Characteristics of Individuals with Disabilities (n=384)

	Number (Percentage)		Number (Percentage)
Gender		**Educational Status of Mothers**	
Female	162 (42.2)	Not literate	29 (7.6)
Male	222 (57.8)	Literate	8 (2.1)
Age Group (Year)		Primary school graduate	192 (50.0)
1-3	15 (3.9)	Secondary school graduate	50 (13.0)
4-6	63 (16.4)	High-school graduate	90 (23.4)
7-9	80 (20.8)	Bachelor's degree	11 (2.9)
10-13	102 (26.6)	Missing data	4 (1.0)
14-18	60 (15.6)	**Educational Status of Fathers**	
19-30	46 (12.0)	Not literate	3 (0.7)
31-41	18 (4.7)	Literate	10 (2.6)
Type of Disability		Primary school graduate	117 (30.5)
Only mental	92 (24.0)	Secondary school graduate	48 (12.5)
Only physical	190 (49.5)	High-school graduate	150 (39.1)
Both mental and physical	46 (12.0)	Bachelor's degree	43 (11.2)
Other disabilities*	56 (14.5)	Postgraduate	5 (1.3)
The Presence of Diseases Except Their Disabilities		Missing data	8 (2.1)
Yes	73 (19.0)	**Educational Status of Individuals with Disabilities**	
No	311 (81.0)	Not literate	210 (54.8)
The Reason for the Disability		Literate	60 (15.6)
Genetic	84 (21.9)	Primary school graduate	65 (16.9)
During birth	145 (37.8)	Secondary school graduate	21 (5.5)
An accident	8 (2.2)	High-school graduate	19 (4.9)
Other causes**	147 (38.5)	Missing data	9 (2.3)
		Consanguineous Marriage	
		Yes	124 (32.3)
		No	257 (66.9)
		Missing data	3 (0.8)

*Special learning disabilities, common developmental disorders **Polio, postoperative, remittance, etc. or unknown

It was observed that the energy intakes of individuals with disabilities in all age groups deviated negatively from the reference energy value; the energy ratio from carbohydrates was found to be low, the protein ratio was within the appropriate range and the fat ratio was high. Daily polyunsaturated fatty acid intake was higher than recommended in most age groups ($p<0.05$). Fiber intake was found to be low and statistically significant in both genders in all age groups, except for the male aged 31-50 ($p<0.05$) (Table 2).

Table 2. Energy, Macronutrients, and Fiber Intakes Status of Individuals with Disabilities According to Age and Gender (n=384)

Energy and Macro nutrients	Age Group (Year)	Gender	X̄±SD	Reference	Mean Difference	p*
Energy (kcal/day)	1-3	-	1094.4±507.4	1250	-155.6	0.255
	4-6	-	1465.6±545.87	1650	-184.4	**0.009**
	7-9	-	1545.0±751.79	1850	-305.0	**0.001**
	10-13	Male	1646.4±570.03	2445	-798.6	**0.000**
		Female	1755.5±607.69	2200	-444.5	**0.000**
	14-18	Male	1762.7±591.36	2860	-1097.3	**0.000**
		Female	1605.9±708.76	2260	-654.1	**0.000**
	19-30	Male	1833.6±1000.61	2850	-1016.4	**0.000**
		Female	1360.8±446.58	2180	-819.2	**0.000**
	31-50	Male	1722.3±745.01	2623	-900.7	**0.019**
		Female	1424.5±516.72	2065	-640.5	**0.002**
Carbohydrate (%)	1-3	-	41.1±17.15	50-60	–	NA
	4-18	-	47.3±10.40	50-60	–	NA
	≥19	-	44.8±12.65	55-60	–	NA
Protein (g/day)	1-3	-	34.4±17.52	15-18.8	+	NA
	4-6	-	45.7±18.37	20-25.5	+	NA
	7-9	-	48.5±28.56	26-38.7	+	NA
	10-13	Male	50.5±21.04	39-59.8	=	NA
		Female	57.9±24.30	39-45.5	+	NA
	14-18	Male	57.1±25.45	54-71.5	=	NA
		Female	48.1±25.20	43-66.0	=	NA
	19-30	Male	60.8±30.21	58-72.0	=	NA
		Female	49.8±24.51	47-59.0	=	NA
	31-50	Male	51.1±21.36	60-75.0	–	NA
		Female	41.8±18.07	50-63.0	–	NA
Protein (%)	1-3	-	12.7±5.82	5-20	=	NA
	4-18	-	13.1±3.82	10-20	=	NA
	≥19	-	13.9±4.87	10-15	=	NA
Fat (%)	1-3	-	39.5±15.16	30-40	=	NA
	4-18	-	39.7±9.36	25-35	+	NA
	≥19	-	41.2±12.41	20-30	+	NA
Polyunsaturated Fatty Acid (g) (w-3 + w-6)	1-3	-	12.0±11.72	7.7	+4.3	0.179
	4-6	-	17.7±12.82	10.9	**+6.8**	**0.000**
	7-9	-	17.1±10.99	10.9	**+6.2**	**0.000**
	10-13	Male	21.6±11.1	13.2	**+8.4**	**0.000**
		Female	18.8±8.86	10.1	**+8.7**	**0.000**
	14-18	Male	19.3±7.38	17.6	+1.7	0.217
		Female	20.6±13.4	12.1	**+8.5**	**0.002**
	19-30	Male	27.5±45.48	18.6	+8.9	0.326
		Female	15.2±8.96	13.1	+2.1	0.308
	31-50	Male	16.9±4.47	18.6	-1.7	0.343
		Female	19.9±11.1	13.1	+6.8	0.071
Fiber (g)	1-3	-	10.6±7.57	19	**-8.4**	**0.001**
	4-6	-	16.8±9.38	25	**-8.2**	**0.000**
	7-9	-	16.3±8.74	25	**-8.7**	**0.000**
	10-13	Male	19.0±8.86	29	**-10.0**	**0.000**
		Female	20.5±8.57	26	**-5.5**	**0.000**
	14-18	Male	19.3±9.06	29	**-9.7**	**0.000**
		Female	17.0±8.17	26	**-9.0**	**0.000**
	19-30	Male	18.3±8.10	29	**-10.7**	**0.000**
		Female	16.3±7.05	25	**-8.7**	**0.000**
	31-50	Male	22.9±10.57	29	-6.1	0.179
		Female	18.7±7.40	25	**-6.6**	**0.014**

+ Above the normal range = Between the normal range – Under the normal range

When the daily vitamin intake levels of individuals were compared with the recommended reference level, it was found that while vitamin A was high in both genders in the 4-6 age group and 10-13 age group, it was low in males in the

14-18 age group and high in females in the 19-30 age group ($p<0.05$). Vitamin E was high in both genders in the age group of 18 and under ($p<0.05$). While vitamin B_1 was low in both genders in the 10-30 age group, it was low in males in the 31-50 age group ($p<0.05$). Vitamin B_2 was high in both genders under the age of 14, low in males in the 14-18 and 19-30 age groups, and low in both genders in the 31-50 age group ($p<0.05$). While vitamin B_6 was high in both genders in the age group under the age of 10, it was low in males aged 14-18, and in both genders in the age group of 19-30 and in the age group of 31-50 ($p<0.05$). Folic acid was low in both genders at the age of 10 or over ($p<0.05$). Vitamin C was high in both genders in the 4-6 age group, 7-9 age group and 10-13 age group ($p<0.05$) (Table 3).

When the daily mineral intake levels of individuals were compared with the recommended reference level, calcium and magnesium were found to be low in both genders in all age groups ($p<0.05$) (Low magnesium intake was not found to be statistically significant only in the females aged 10-13 years). Phosphorus was high in individuals under the age of 10, iron was low, phosphorus was low in both genders in the 10-18 age group but high in males in the 19-30 age group, iron was found to be low in males aged 10-13, and in females aged 14 and older ($p<0.05$). Zinc was high in both genders in the 4-9 age group and low in both genders in all other age groups ($p<0.05$) (Table 3).

Table 3. Vitamin and Mineral Intake Status of Individuals with Disabilities According to Age and Gender (n=384)

Vitamin / Mineral	Age group (year)	Gender	$\bar{X}$±SD	Reference	Mean Difference	p*
Vitamin A (µg)	1-3	-	524.0±412.92	300	+224.0	0.054
	4-6	-	779.4±530.28	400	**+379.4**	**0.000**
	7-9	-	1005.7±2739.84	500	+505.7	0.103
	10-13	Male	874.5±582.4	600	**+274.5**	**0.000**
		Female	999.6±552.7	600	**+399.6**	**0.000**
	14-18	Male	723.4±446.26	900	**-176.6**	**0.035**
		Female	815.6±697.39	700	+115.6	0.380
	19-30	Male	988.6±624.78	900	+88.6	0.476
		Female	1093.0±764.43	700	**+393.0**	**0.033**
	31-50	Male	965.5±623.88	900	+65.5	0.791
		Female	837.7±506.59	700	+137.7	0.389
Vitamin E Equivalent (mg)	1-3	-	11.9±10.24	6	**+5.9**	**0.043**
	4-6	-	16.8±12.17	7	**+9.8**	**0.000**
	7-9	-	17.2±10.60	7	**+10.2**	**0.000**
	10-13	Male	20.4±10.75	11	**+9.4**	**0.000**
		Female	19.0±8.29	11	**+8.0**	**0.000**
	14-18	Male	19.1±7.86	15	**+4.1**	**0.007**
		Female	19.3±10.96	15	**+4.3**	**0.045**
	19-30	Male	26.4±45.31	15	+11.4	0.211
		Female	14.9±7.80	15	-0.1	0.938
	31-50	Male	17.2±4.35	15	+2.2	0.224
		Female	16.9±5.73	15	+1.9	0.305
Vitamin B_1 (mg)	1-3	-	0.5±0.26	0.5	-0.0	0.984
	4-6	-	0.6±0.26	0.6	+0.0	0.757
	7-9	-	0.6±0.30	0.6	+0.0	0.842
	10-13	Male	0.7±0.27	0.9	**-0.2**	**0.000**
		Female	0.7±0.26	0.9	**-0.2**	**0.000**
	14-18	Male	0.7±0.27	1.2	**-0.5**	**0.000**
		Female	0.6±0.30	1.0	**-0.4**	**0.000**
	19-30	Male	0.7±0.29	1.2	**-0.5**	**0.000**

		Female	0.6±0.37	1.1	**-0.5**	**0.000**
	31-50	Male	0.7±0.32	1.2	**-0.5**	**0.007**
		Female	0.8±0.88	1.1	-0.3	0.234
Vitamin B_2 (mg)	1-3	-	1.0±0.35	0.4	**+0.6**	**0.000**
	4-6	-	1.0±0.37	0.5	**+0.5**	**0.000**
	7-9	-	1.1±0.83	0.6	**+0.5**	**0.000**
	10-13	Male	1.1±0.45	0.9	**+0.2**	**0.002**
		Female	1.2±0.56	0.9	**+0.3**	**0.009**
	14-18	Male	1.1±0.47	1.3	**-0.2**	**0.005**
		Female	0.9±0.45	0.9	+0.0	0.711
	19-30	Male	1.1±0.44	1.3	**-0.2**	**0.019**
		Female	0.9±0.35	1.0	-0.1	0.349
	31-50	Male	0.9±0.42	1.3	**-0.4**	**0.048**
		Female	0.8±0.40	1.1	**-0.3**	**0.023**
Vitamin B_6 (mg)	1-3	-	0.8±0.39	0.5	**+0.3**	**0.028**
	4-6	-	1.0±0.41	0.6	**+0.4**	**0.000**
	7-9	-	0.9±0.55	0.6	**+0.3**	**0.000**
	10-13	Male	1.1±0.45	1.0	+0.1	0.372
		Female	1.1±0.52	1.0	+0.1	0.175
	14-18	Male	0.9±0.35	1.3	**-0.4**	**0.000**
		Female	1.0±0.53	1.2	-0.2	0.088
	19-30	Male	1.1±0.52	1.3	**-0.2**	**0.026**
		Female	0.8±0.35	1.3	**-0.5**	**0.000**
	31-50	Male	1.0±0.28	1.3	**-0.3**	**0.021**
		Female	0.9±0.46	1.3	**-0.4**	**0.010**
Folate (µg)	1-3	-	124±75.79	150	-26.0	0.206
	4-6	-	200.7±108.51	200	+0.7	0.959
	7-9	-	194.7±101.51	200	-5.3	0.640
	10-13	Male	224.2±90.67	300	**-75.8**	**0.000**
		Female	241.5±75.22	400	**-158.5**	**0.000**
	14-18	Male	232.5±99.04	400	**-167.5**	**0.000**
		Female	210.1±94.17	400	**-189.9**	**0.000**
	19-30	Male	258.0±111.11	400	**-142.0**	**0.000**
		Female	198.5±79.39	400	**-201.5**	**0.000**
	31-50	Male	260.8±124.32	400	**-139.2**	**0.025**
		Female	225.2±83.72	400	**-174.8**	**0.000**
Vitamin C (mg)	1-3	-	66.9±69.1	60	+6.9	0.704
	4-6	-	84.1±75.34	60	**+24.1**	**0.014**
	7-9	-	74.8±61.37	60	**+14.8**	**0.034**
	10-13	Male	109.3±86.60	75	**+34.3**	**0.002**
		Female	111.5±59.02	75	**+36.5**	**0.001**
	14-18	Male	81.6±84.82	75	+6.6	0.668
		Female	88.2±82.40	75	+13.2	0.396
	19-30	Male	92.6±76.28	90	+2.6	0.865
		Female	88.2±65.43	90	-1.8	0.905
	31-50	Male	81.0±54.55	90	-9.0	0.676
		Female	66.5-54.66	90	-23.5	0.184
Calcium (mg)	1-3	-	650.5±227.84	800	**-149.5**	**0.024**
	4-6	-	607.3±262.62	800	**-192.7**	**0.000**
	7-9	-	642.3±463.02	800	**-157.7**	**0.003**
	10-13	Male	608.2±279.85	1300	**-691.8**	**0.000**
		Female	634.3±342.90	1300	**-665.7**	**0.000**
	14-18	Male	540.6±323.49	1300	**-759.4**	**0.000**
		Female	549.2±281.93	1300	**-750.8**	**0.000**
	19-30	Male	539.2±220.0	1000	**-460.8**	**0.000**
		Female	498.4±184.97	1000	**-501.6**	**0.000**

	31-50	Male	438.9±262.39	1000	**-561.1**	**0.001**
		Female	394.3±216.48	1000	**-605.7**	**0.000**
Magnesium (mg)	1-3	-	142.2±75.97	80	**+62.2**	**0.007**
	4-6	-	195.5±84.1	130	**+65.5**	**0.000**
	7-9	-	190.9±108.79	130	**+60.9**	**0.000**
	10-13	Male	214.4±81.52	240	**-25.6**	**0.013**
		Female	237.3±96.83	240	-2.7	0.867
	14-18	Male	191.4±75.00	410	**-218.6**	**0.000**
		Female	207.4±91.87	360	**-152.6**	**0.000**
	19-30	Male	201.4±75.10	400	**-198.6**	**0.000**
		Female	181.9±83.72	310	**-128.1**	**0.000**
	31-50	Male	181.4±62.78	420	**-238.6**	**0.000**
		Female	176.7±85.07	320	**-143.3**	**0.000**
Phosphorus (mg)	1-3	-	694.9±271.85	460	**+234.9**	**0.005**
	4-6	-	830.1±284.63	500	**+330.1**	**0.000**
	7-9	-	884.8±493.69	500	**+384.8**	**0.000**
	10-13	Male	886.7±322.32	1250	**-363.3**	**0.000**
		Female	974.8±387.90	1250	**-275.2**	**0.000**
	14-18	Male	895.1±334.21	1250	**-354.9**	**0.000**
		Female	850.4±358.93	1250	**-399.6**	**0.000**
	19-30	Male	934.0±402.04	700	**+234.0**	**0.007**
		Female	792.1±281.95	700	+92.1	0.160
	31-50	Male	782.5±339.11	700	+82.5	0.544
		Female	661.7±212.40	700	-38.3	0.563
Iron (mg)	1-3	-	4.6±3.28	7	**-2.4**	**0.015**
	4-6	-	7.6±3.14	10	**-2.4**	**0.000**
	7-9	-	8.0±4.11	10	**-2.0**	**0.000**
	10-13	Male	9.0±3.72	10/10	**-1.0**	**0.039**
		Female	9.8±3.15		-0.2	0.731
	14-18	Male	8.9±3.49	10/18	-1.1	0.086
		Female	8.2±3.72		**-9.8**	**0.000**
	19-30	Male	9.5±3.85	10/18	-0.5	0.525
		Female	8.1±2.83		**-9.9**	**0.000**
	31-50	Male	9.8±3.12	10/18	-0.2	0.873
		Female	8.3±3.06		**-9.7**	**0.000**
Zinc (mg)	1-3	-	4.0±2.10	3	+1.0	0.082
	4-6	-	6.3±2.66	5	**+1.3**	**0.000**
	7-9	-	6.9±4.23	5	**+1.9**	**0.000**
	10-13	Male	6.9±2.71	11	**-4.1**	**0.000**
		Female	7.9±3.14	10	**-2.1**	**0.000**
	14-18	Male	7.8±3.38	11	**-3.2**	**0.000**
		Female	6.6±3.77	10	**-3.4**	**0.000**
	19-30	Male	7.6±3.02	11	**-3.4**	**0.000**
		Female	6.6±2.93	10	**-3.4**	**0.000**
	31-50	Male	6.9±3.43	11	**-4.1**	**0.020**
		Female	5.5±2.06	10	**-4.5**	**0.000**

Discussion

In this study, it was observed that male individuals with disabilities who attended special education and rehabilitation centers were more than women, and that most of the individuals with disabilities (83.3%) were children and adolescents. It was determined that 4.9% of individuals with disabilities were high school graduates. In addition to the educational inequalities and reasons caused by the disability, this study reveals low levels of education in individuals with disabilities due to the fact that most of the individuals with disabilities were under the age of 18.

It was reported that the education levels of the families with disabled children had significant effects on their dreams and plans about the future (Cangür et al., 2013). In a study, it was stated that parents with low income and education level had low awareness about the needs of children with disabilities for special health services; and it was reported that this caused less access to health services (Porterfield & McBride, 2007). In this study, it was determined that the education levels of the parents of individuals with disabilities were low and that there were even cases with illiterate parents. This suggests that there is a need for more studies on ensuring that these families receive support and their awareness about health is increased.

It is known that the frequency of consanguineous marriages in North Africa, Middle East and West Asian countries is between 20-50% (Hamamy, 2012). It was reported that the risk of genetic disorders, congenital anomalies, mental retardation, infant and child mortality was high in children who were born as a result of consanguineous marriage, which could be defined as marriage among the second cousin or closer relative (Hamamy, 2012; Mazharul Islam, 2017). Consanguineous marriages are also very frequent (24%) in Turkey (Hacettepe University Institute of Population Studies, 2019). Therefore, in this study, the consanguinity of the parents was also questioned and it was determined that approximately one in three parents (32.3%) had consanguineous marriages. This result suggested that the individuals should be informed more about the negative health effects and risks of consanguineous marriage on the new-borns. In addition, 37.8% and 21.9% of individuals' disabilities were caused by birth and genetic reasons respectively. It was thought that there is a connection between the high consanguineous marriage ratio and disability reasons.

In order to reduce the health inequalities experienced by the individuals with disabilities, it was reported in the World Health Organization Global Disability Action Plan (2014-2021) that the existing health systems should be more inclusive and the public health programs (promotion of advanced nutrition and physical activities including those that are required for a healthy life style) should be more accessible for the individuals with lifelong disabilities (World Health Organization, 2015). Since the health problems associated with insufficient and unbalanced nutrition were common in individuals with disabilities (Bertoli et al., 2006a; Bertoli et al., 2006b; AbdAllah et al., 2007; Neyestani et al., 2010; Nogay, 2013), increasing their and their families' knowledge about nutrition, making them use nutritional counselling services more and making them participate in various projects, programs and nutrition trainings play an important role in the protection and improvement of their health status. Therefore, the results of this study showed that no disabled individuals participating in the study met their energy requirement, the ratios of energy from macronutrients were largely not within the recommended range and there was low fiber intake. It is especially worrying that the fat intake is high and the fiber intake is low. These results are in line with other studies. In a study conducted in Northern Cyprus with children and adolescents with autism aged 3-18, 17.9% and 30.8% of them had insufficient energy and fiber intake respectively (Zeybek & Yurttagul, 2020). Hastert et al. (2021) determined that mean 8.4 grams fiber intake per 1000 kcal of energy were taken daily in individuals with intellectual and developmental disabilities aged >14 years. In another study, the ratio of meeting the daily energy requirement was around 75%, while the ratio of meeting the fiber requirement remained at around 60% in children and adolescents with intellectual disabilities. Similar to our study, their protein intake was higher than Dietary Reference Intakes (DRI), almost twice (Sahin & Nogay, 2021). These results reveal the necessity of investigating the reasons for this situation.

Sufficient energy intake is very important for the many functions in the body and for the maintenance of life. However, the macronutrient ratios of energy are also important, regardless of sufficient energy intake. In a study with adult individuals with Down Syndrome, the contribution of macronutrients to total energy intake in female and male respectively was 43.3% and 45.6% in carbohydrates, 18.8% and 16.3% in protein, and 37.9% and 38.1% in fat (Marín & Graupera, 2011). In this study, the contribution of carbohydrate, protein and fat to energy intake was found to be 44.8%, 13.9% and 41.2%, respectively, in adults (≥19 years), and it was found that the energy distribution was unbalanced, the energy rate from carbohydrates was low and the rate of fat was high. In another study conducted with epileptic children, 40% of children were found to have malnutrition and 24% had advanced malnutrition; and the distribution of daily energy intake into dietary nutrients was found to be unbalanced in these individuals (protein, fat, and carbohydrates respectively constituted 18, 39%, 43% of the total daily energy intake). Daily intake of calcium, iron and zinc was reported to be less than 60% of the recommended amount (RDA-Recommended Dietary Allowance) (Bertoli et al., 2006b). In this study, insufficient intake of calcium and iron in all age groups has drawn attention.

Vitamin-mineral deficiencies, obesity and malnutrition were common health problems observed in the individuals with disabilities. In the study carried out with 290 physically disabled children in the 6-12 age group in Iran, the mean energy intake was more than 90% of the requirement, while more than half of the children could not meet their calcium and iron daily requirement, excessive intake of protein, vitamins A and C was observed (Neyestani et al., 2010). In another study conducted with 639 mentally disabled children between the ages of 6-14 in Egypt, iron deficiency anemia, alpha-tocopherol, zinc, magnesium, and copper deficiencies were determined, and high levels of malnutrition were reported. Micronutrient deficiencies, that increased with age and low socioeconomic level, were more common in children with mental disabilities (AbdAllah et al., 2007). In this study, in children of similar age groups A, B_2, B_6, C vitamins, magnesium and phosphorus were found to be higher than the reference values in most age groups, while folic acid, calcium and iron remained below recommendation levels. Daily energy intake was significantly lower than the recommended reference value in all age groups over 3 years old ($p<0.05$). In Nogay's study with individuals with mental disabilities aged 10-18, while calcium and folic acid in girls aged 10-13, vitamin C and calcium intake at 14-18 were lower than recommended, in boys, calcium intake was insufficient in both age groups (Nogay , 2013). In this study, in 10-18 age group individuals, Vitamin B_1, folic acid, calcium, phosphorus and zinc intake demonstrated negative deviations from the recommended value in both genders ($p<0.05$). In the case-control study of Marí-Bauset et al., children with autism between the ages of 6-10 were found to have higher daily vitamin E intake compared to healthy children; and a positive deviation from the reference was observed in the same age group ($p=0.000$) (Marí-Bauset et al., 2015). Bandini et al. (2021) investigated the differences between typically developing children and children with intellectual disabilities in the aspect of nutrition. According to this study results, it was stated that children had Estimated Average Requirement/Adequate Intake (EAR/AI) for most nutrients. However, most of the children in both groups did not meet the EAR for vitamins E and D and calcium and the AI for vitamin K. In this study, however, insufficiencies of other micro nutrients changed according to age and gender and a substantial number of individuals did not meet B_1 vitamin, folate, calcium, iron, and zinc requirements.

Conclusions and Recommendations

In this study, it has been determined that the ratio of the total energy consumed by individuals with disabilities from carbohydrates was lower than the reference, the fat ratio was high and protein ratios were in the normal range relatively. In almost all people with disabilities, fiber, calcium and iron intake were significantly lower than reference values based on age and gender. There was a significant negative deviation from reference values in both genders in thiamine and folate intake. In the gender and age groups of individuals with disabilities, serious vitamin and mineral deficiencies were noted.

In order to improve the nutritional problems of individuals with disabilities and to ensure their sufficient and balanced nutrition, activities should be developed for the individuals and their families. These activities can be in the form of trainings by the dietician and the implementation of medical nutrition therapy in cooperation with the physician taking into account the disability status and existing diseases besides general nutrition education. In addition, it is believed that the questioning of the nutritional habits of individuals with disabilities at all ages and evaluating their nutrition states through anthropometric measurements would play an important role in improving their health.

Ethical Approval of the Study

Before data collection, the participants and their parents were informed about the research, and their verbal permissions and written consents were obtained. In this study, Helsinki Declaration principles were followed. Necessary permissions were obtained from the Governorship of Kirikkale and the Provincial Directorate of National Education for the study. Besides, permission was obtained from the Social and Humanities Research Ethics Committee at Kirikkale University.

Conflict of Interest

The authors declare no conflict of interest.

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Authorship Contribution

BÇ: Conceptualization, methodology, data collection, statistical analysis, writing the original draft. FNK: Conceptualization, methodology, investigation, writing- review & editing, supervision. ABG: Conceptualization, methodology, data collection, statistical analysis, writing the original draft. EME: Conceptualization, methodology, data collection, statistical analysis, writing the original draft. ÇÖ: Conceptualization, methodology, data collection, statistical analysis, writing the original draft. All authors contributed to and have approved the final manuscript.

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