Evaluation of Nutrition Software Used in Türkiye: A Comparison of CeviCal and BeBIS with TürKomp

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Abstract

This study aims to compare the food information programs used in Türkiye, CeviCal and BeBİS, and evaluate how they differ from TürKomp. Data on food consumption records, consumption frequency, and anthropometric measurements of healthy individuals obtained from previous studies were entered into the CeviCal, BeBİS and TürKomp programs. Energy and nutritional values were analyzed to compare these two programs using TürKomp as the reference standard. According to the food consumption record data entered, there was no significant difference in carbohydrate and fat percentages among the three programs ($p>0.05$), while significant differences were found in other nutrients ($p<0.05$). No difference was found between TürKomp and CeviCal in the values of macronutrients, such as energy, carbohydrate, protein and fat ($p>0.05$). A significant and high-level positive correlation was found between TürKomp and both CeviCal and BeBİS in energy, protein and carbohydrate values. According to food consumption frequency data, there was no significant difference in energy, protein and fat percentage between TürKomp and CeviCal ($p>0.05$), while a significant difference was found with BeBİS ($p<0.05$). A high level of positive correlation was found between TürKomp and CeviCal in terms of energy, protein, carbohydrate and fat values. However, a moderate level of positive correlation was found between TürKomp and BeBIS. When BeBİS and CeviCal programs used in Türkiye were compared to TürKomp, CeviCal gave more consistent results in carbohydrate, protein and fat values. There were similarities and differences between the three programs in terms of other nutrients. However, larger studies comparing data from all programs are needed to support the current findings.

Keywords: Nutrient analysis, Nutrition information programs, Food consumption, Food consumption frequency survey.

Research Article / *Received: 14 May 2025, Accepted: 20 June 2025, Published Online: 25 June 2025.*

1. Introduction

Nutrition is the process of consuming and utilizing food substances to sustain life and maintain health (Özer & Tekinşen, 2021). Ongoing research explores the relationship between nutrient content, intake levels, physiological functions, and overall health maintenance (Council, 2006). The specific combinations of macronutrients that effectively optimize health remain uncertain. The World Health Organization (WHO) has published a booklet outlining the recommended intake levels for certain nutrients (World Health Organization, 2019). Many countries also conduct national dietary studies to assess macronutrient distribution and disseminate findings to the public (Trumbo et al., 2002).

Food composition databases have been developed to identify the nutrient content of foods and make this information accessible to the public (U.S. Department of Agriculture [USDA], 2019). Similarly, TürKomp (Turkish Food Composition Database) has been developed in our country. TürKomp includes the nutrient components of numerous processed and unprocessed agricultural products (TürKomp, 2015).

In dietary practice, exchange lists have been developed to facilitate the practical substitution of foods with similar nutritional compositions (Usman, 1973). The increasing number of studies in nutrition and the establishment of comprehensive food composition databases have created a need for developing more specific dietary plans and for their effective monitoring. Food composition software programs are utilized in academic research to analyze survey data collected for assessing individuals' dietary habits (Yeung, 2023).

CeviCal is a web-based application that enables remote monitoring of patients' daily physical activity

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https://doi.org/10.56479/ijgr-54

ISSN: 2980-1532

levels, medication use, and dietary intake records. In addition, it provides a comprehensive nutritional assessment by analyzing the energy and macro- and micronutrient contents of the recorded foods (Cesur, 2024a; Cesur & Genç, 2024).

BeBIS, which has been extensively utilized and widely recognized in Türkiye over the years, is a conventional nutrition software that operates via a local driver and does not require an internet connection, making it suitable primarily for expert users (Cesur et al., 2022).

This study aims to compare the nutrition information software programs widely used in Türkiye—CeviCal and BeBIS—and to assess their discrepancies in reference to the Turkish Food Composition Database (TürKomp).

2. Material and Methods

2.1. Type, Aim, and Study Sample

This study employed a comparative research design. It was planned to compare the BeBIS and CeviCal dietary assessment programs using TürKomp as the reference database. Accordingly, differences between the two programs were evaluated using dietary records and food frequency data obtained from previous studies for which ethical approvals had been granted. CEBEBİS and CeviCal use the same nutritional database.

This study compiled dietary record questionnaires, food frequency forms, and anthropometric measurements from 400 participants aged 18 and above derived from earlier research. Surveys with incomplete or incorrect information were identified by the researchers, and these participants were excluded from this study; therefore, these data were not entered into the nutrient analysis programs. As a result, dietary records of 338 participants and food frequency data of 370 participants were transferred into the programs for analysis.

2.2. Data Collection

Study Data: The data used in this study included information obtained from dietary record questionnaires and food frequency forms collected in previous research.

Dietary Records: The dietary records utilized in this study were collected by documenting all foods consumed over two consecutive weekdays and one weekend day. This method was chosen because it is more effective in identifying individuals' general dietary habits (Cesur, 2024b; Cesur et al., 2023; Cesur & Öztürk Kara, 2024). These three-day dietary records were divided by three to calculate the average daily energy and nutrient intakes.

Food Frequency: The food frequency questionnaire is tailored for specific research objectives and is used to assess individuals' nutritional status (Cesur, 2024b; Cesur et al., 2023; Cesur & Öztürk Kara, 2024). In this study, a food frequency questionnaire consisting of 45 food items and six frequency options was used. As a result, the average daily intake of energy and nutrients was calculated based on the participants' reported food consumption frequencies.

Incomplete and inconsistent data entries were excluded from the analysis. No imputation method was employed. Only complete cases were analyzed to preserve the accuracy of inter-program comparisons in this study.

2.3. Data Processing

Each participant's dietary intake record, food consumption frequency, and anthropometric measurements were entered into the programs as individual cases. The input data were transferred to Microsoft Excel. Nutrient information from the TürKomp database was also saved in Microsoft Excel.

For the nutrient analysis programs (BeBIS and CeviCal), the collected three-day dietary intake records were processed through the programs and then exported to Microsoft Excel. To obtain the average daily energy and nutrient values, the total amounts were divided by three. Food consumption frequency data were recorded by noting the portion sizes consumed from the food groups on the form and transferring them to Microsoft Excel.

Cooking losses were calculated using standardized loss percentages provided in the TÜBER database. For example, common cooking methods, such as boiling and grilling, were applied with their corresponding nutrient loss ratios to convert raw food values to cooked equivalents.

TürKomp is a national database developed through advanced laboratory analyses to determine the compositional values of foods produced and consumed in Türkiye (TürKomp, 2015). Accordingly, TürKomp served as the reference to evaluate the differences between the two nutrition software programs. Since TürKomp does not provide a system for direct data entry, a customized Excel format was developed to enable the analysis of dietary intake data. In this format, the cooked forms of foods listed as raw in the TürKomp database were calculated using the cooking loss percentages provided by TÜBER (Turkish Food Composition and Cooking Loss Database) as a reference. For each food item, standard portion sizes and cooking method-specific loss rates were taken into account to convert raw amounts into cooked equivalents, thereby allowing for a more accurate analysis of dietary intake. Additionally, recipes that were reported in the dietary records but not available in TürKomp were identified, formulated, and added to the Excel format. Dietary intake data were entered for three consecutive days, and the total intake was divided by three to calculate the daily average energy and nutrient values. To allow for the inclusion of food frequency data, a food frequency questionnaire was developed using the food items and food groups available in TürKomp in accordance with standard survey formats. Portion sizes consumed were recorded based on reported frequencies, and daily average energy and nutrient values were calculated accordingly. Due to the large sample size, a G*Power analysis was conducted, and each sample group was randomly selected to include 68 healthy individuals. The power analysis was performed using G*Power software (version 3.1.9.4). The effect size (f) was set at 0.25 (medium effect), $\alpha = 0.05$, and $1-\beta$ (power) = 0.90, resulting in a required sample size of 68 participants for each comparison group.

2.4. Statistical Analysis

Statistical analyses were performed using RStudio software version 0.98.501, developed with the R programming language. Non-parametric methods were preferred since the data did not follow a normal distribution based on the Kolmogorov–Smirnov and Shapiro–Wilk tests. Therefore, the Wilcoxon Signed-Rank Test and Friedman Test were used instead of paired t-tests and repeated measures ANOVA. Continuous variables were presented as mean ± standard deviation (SD), while categorical variables were expressed as counts and percentages. When data did not follow a normal distribution, the Wilcoxon Signed-Rank Test was applied for dependent groups, for comparisons involving three related groups, the Friedman Variance Analysis was used. A p-value below 0.05 was considered statistically significant. G-Power software version 3.1.9.4 was also employed to determine the required sample size. Bonferroni correction was applied to p-values derived from post hoc pairwise tests to reduce the probability of Type I error resulting from multiple comparisons.

2.5. Ethics Approval

The data obtained from previous studies for which ethical approval was obtained were entered into these three programs. Ethics committee decisions are stated respectively. It was obtained from the Avrasya University Ethics Committee on 29.06.2021 with the decision numbered E-69268593-050-4141 and from the Avrasya University Ethics Committee on 02.12.2022 with the decision numbered E-69268593-050-16127.

3. Results

Analysis of dietary intake records from 338 healthy individuals showed that 239 were female (70.7%) and 61 were male (18%). Demographic data indicated a mean age of 24.52 ± 5.10 years, a mean height of 164.12 ± 7.77 cm, and a mean body weight of 62.61 ± 13.82 kg. The mean Body Mass Index (BMI) was calculated as 23.17 kg/m². Based on G-power analysis, the selected sample of 68 healthy individuals included 52 females (76.5%) and 16 males (23.5%), with a mean age of 23.97 ± 4.19 years, mean height of 165.10 ± 6.84 cm, and mean body weight of 61.72 ± 12.84 kg.

In this study, dietary intake records of 338 healthy individuals were entered into the CeviCal and BeBIS programs, and nutrient components were compared between these two software. Evaluations revealed no significant difference in fat percentage ($p > 0.05$), whereas significant differences were found in all other nutrient components ($p < 0.05$) (Table 1).

Dietary intake records of 68 healthy individuals were entered into the CeviCal, BeBIS, and TürKomp programs. No significant differences were in portion sizes were observed among the three software platforms. Additionally, no significant differences were observed in the percentages of carbohydrates and fats among the nutrient components ($p > 0.05$). While no significant differences were detected between TürKomp and CeviCal for macronutrients, including energy, carbohydrate, protein, and fat, as well as micronutrients, such as vitamin C, vitamin A, and eicosapentaenoic acid (EPA) ($p > 0.05$), significant differences were found between BeBIS and both TürKomp and CeviCal ($p < 0.05$). No significant differences were noted between BeBIS and TürKomp for vitamin B6 and vitamin E values ($p > 0.05$), whereas significant differences existed between CeviCal and TürKomp ($p < 0.05$) (Table 2).

When the programs were normalized on a gram basis, and nutrient contents per 100 grams were examined, no significant differences were found among the three programs for carbohydrate, protein, and fat percentages ($p > 0.05$). Furthermore, no significant differences were identified between TürKomp and CeviCal for carbohydrate, protein, and fat values ($p > 0.05$); however, significant differences were observed between BeBIS and CeviCal, as well as between BeBIS and TürKomp for these nutrients ($p < 0.05$) (Table 2).

Table 1. Analysis of dietary intake records using CeviCal and BeBIS programs

	CeviCal (n=338)			*BEBİS (n=338)*			*p*
	Mean	*Min.*	*Max.*	*Mean*	*Min.*	*Max.*	
Energy (kcal)	146.88	46.74	287.48	113.70	39.35	240.93	< 0.001
CHO (g)	15.54	1.66	38.29	11.33	2.48	24.67	< 0.001
CHO (%)	4.86	1.30	18.23	4.51	0.97	21.76	< 0.001
Protein (g)	6.43	2.37	11.57	4.80	1.16	10.82	< 0.001
Protein %	2.11	0.43	7.88	2.00	0.39	8.53	< 0.001
Fat (g)	6.56	2.15	13.58	5.31	0.71	13.55	< 0.001
Fat %	4.79	1.23	14.93	4.79	0.73	17.49	0.127
Dietary Fiber (g)	1.09	0.00	4.23	0.97	0.00	3.37	< 0.001
Cholesterol (g)	16.75	0.00	80.62	26.90	0.41	107.02	< 0.001
PUFA (g)	0.50	0.00	2.04	0.94	0.18	4.81	< 0.001
SFA (g)	1.45	0.15	5.04	2.15	0.18	6.85	< 0.001
MUFA (g)	0.81	0.00	3.29	1.79	0.20	5.82	< 0.001

PUFA: Polyunsaturated Fatty Acids, SFA: Saturated Fatty Acids, MUFA: Monounsaturated Fatty Acids

A significant and strong positive correlation was found between TürKomp and both CeviCal and BeBIS for energy, protein, and carbohydrate values. For fat values, a strong positive correlation was observed between TürKomp and CeviCal, while a moderate positive correlation was identified between TürKomp and BeBIS (Figure 1).

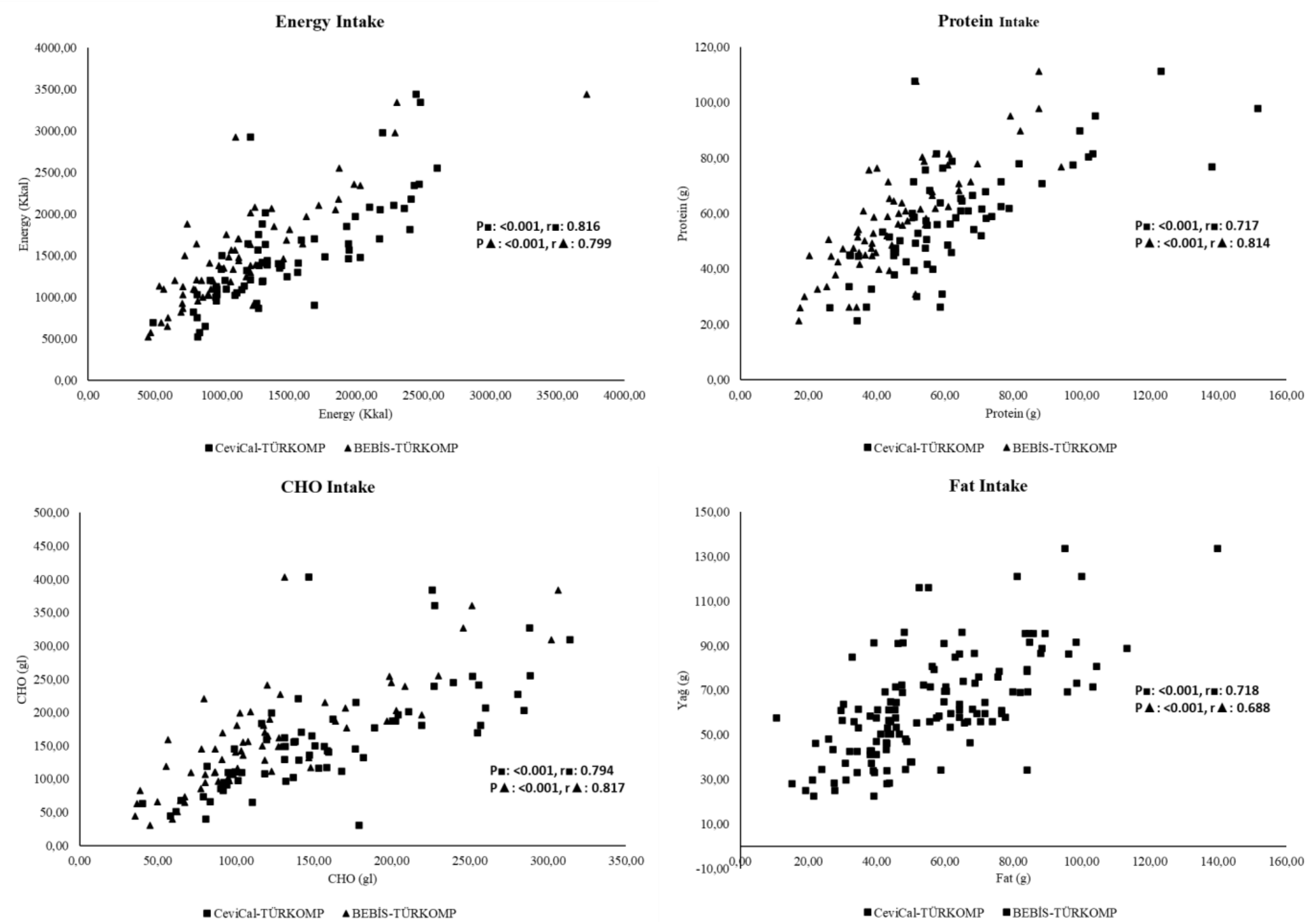

Figure 1. Correlation of dietary intake records with energy, protein, carbohydrate, and fat values

Table 2. Analysis of dietary intake records using CeviCal, BeBIS, and TürKomp programs

	CeviCal (n=68)			*BEBİS (n=68)*			*Türkomp (n=68)*			p	p1	p2	p3
	Mean	*Min.*	*Max.*	*Mean*	*Min.*	*Max.*	*Mean*	*Min.*	*Max.*				
Amount (g)	1019.68	581.00	2252.00	1032.11	500.67	2432.00	1057.42	504.33	2472.00	0.053			
Energy (Kcal)	1474.95	485.72	2603.04	1150.32	449.00	3717.23	1508.17	526.42	3439.01	**< 0.001**	**< 0.001**	0.668	**< 0.001**
CHO (g)	158.42	40.25	314.17	120.44	35.37	306.47	159.11	30.73	402.99	**< 0.001**	**< 0.001**	0.510	**< 0.001**
CHO (%)	42.49	24.80	56.60	41.72	23.16	64.95	41.41	14.18	57.18	0.291			
Protein (g)	62.63	26.24	151.60	45.75	17.07	94.07	58.07	21.25	111.23	**< 0.001**	**< 0.001**	0.215	**< 0.001**
Protein%	17.45	9.22	30.76	16.64	9.41	26.74	16.11	9.19	27.13	**0.011**	0.310	**0.008**	0.510
Fat (g)	64.85	19.23	139.85	49.91	10.67	100.30	64.39	22.66	167.14	**< 0.001**	**< 0.001**	0.607	**< 0.001**
Fat (%)	39.81	25.68	59.66	39.88	13.27	60.15	39.20	23.43	71.92	0.662			
Posa (g)	11.19	1.07	48.13	10.01	1.07	26.39	19.07	5.14	44.74	**< 0.001**	0.391	**< 0.001**	**< 0.001**
PUFA (g)	4.76	0.13	17.03	8.69	2.10	26.50	6.45	1.44	20.58	**< 0.001**	**< 0.001**	0.119	**< 0.001**
SFA (g)	14.78	3.80	46.17	20.23	2.63	41.27	19.55	5.43	53.38	**< 0.001**	**< 0.001**	**0.006**	0.368
MUFA (g)	7.79	0.82	34.14	17.07	2.73	35.37	17.04	6.41	39.91	**< 0.001**	**< 0.001**	**< 0.001**	0.795
Na (mg)	1320.86	145.52	5981.62	2318.65	704.67	6303.40	2585.28	771.87	6397.02	**< 0.001**	**< 0.001**	**< 0.001**	0.595
Vitamin B2 (mg)	0.57	0.03	2.24	0.85	0.20	2.90	0.66	0.24	1.77	**< 0.001**	**< 0.001**	**0.006**	**< 0.001**
Vitamin B6 (mg)	0.49	0.02	1.92	0.88	0.31	2.81	0.85	0.31	1.97	**< 0.001**	**< 0.001**	**< 0.001**	0.864
Vitamin C (mg)	40.13	0.70	159.60	65.33	12.23	525.50	44.32	0.44	197.64	**< 0.001**	**< 0.001**	0.435	**< 0.001**
Vitamin A (µg)	397.05	0.00	4611.36	594.16	96.67	2111.33	264.34	53.91	880.21	**< 0.001**	**< 0.001**	0.346	**< 0.001**
Vitamin E (mg)	3.91	0.00	16.23	6.85	1.70	19.57	7.85	0.62	25.66	**< 0.001**	**< 0.001**	**< 0.001**	0.932
EPA (g)	0.00	0.00	0.29	0.45	0.00	1.57	0.07	0.00	1.09	**< 0.001**	**< 0.001**	0.096	**< 0.001**
ALA (g)	0.22	0.00	1.34	4.97	0.23	20.53	0.38	0.03	1.67	**< 0.001**	**< 0.001**	**0.049**	**< 0.001**
Per 100 g													
Energy (Kcal)	144.73	60.34	216.71	109.81	63.96	198.30	142.37	78.48	236.63	**< 0.001**	**< 0.001**	0.797	**< 0.001**
CHO (g)	15.50	5.00	25.02	11.49	3.79	20.44	14.88	3.63	25.97	**< 0.001**	**< 0.001**	0.510	**< 0.001**
CHO (%)	4.46	1.48	7.83	4.38	0.97	10.56	4.24	0.92	9.50	0.065			
Protein (g)	6.22	2.84	10.01	4.51	2.00	8.19	5.65	2.95	9.93	**< 0.001**	**< 0.001**	0.510	**< 0.001**
Protein%	1.87	0.49	3.94	1.80	0.39	4.12	1.71	0.46	3.96	0.110			
Fat (g)	6.41	2.39	12.27	4.85	1.14	9.49	6.18	3.12	13.43	**< 0.001**	**< 0.001**	0.966	**< 0.001**
Fat (%)	4.23	1.38	7.58	4.22	0.98	7.37	4.11	0.97	9.55	0.416			
Posa (g)	1.13	0.13	4.23	1.00	0.13	2.16	1.83	0.94	3.65	**< 0.001**	0.284	**< 0.001**	**< 0.001**
PUFA (g)	0.49	0.01	1.91	0.85	0.27	2.65	0.64	0.14	2.07	**< 0.001**	**< 0.001**	0.096	**< 0.001**
SFA (g)	1.46	0.47	4.05	1.95	0.28	4.35	1.90	0.73	5.87	**< 0.001**	**< 0.001**	**0.005**	0.178
MUFA (g)	0.80	0.10	3.00	1.66	0.29	3.21	1.66	0.75	4.01	**< 0.001**	**< 0.001**	**< 0.001**	0.607
Na (mg)	126.02	16.89	373.87	226.31	75.15	535.60	252.47	89.23	733.15	**< 0.001**	**< 0.001**	**< 0.001**	0.215
Vitamin B2 (mg)	0.06	0.00	0.26	0.09	0.02	0.36	0.06	0.03	0.15	**< 0.001**	**< 0.001**	0.062	**< 0.001**
Vitamin B6 (mg)	0.05	0.00	0.23	0.09	0.03	0.20	0.08	0.02	0.16	**< 0.001**	**< 0.001**	**< 0.001**	0.932
Vitamin C (mg)	3.95	0.11	12.88	6.23	1.10	35.04	4.24	0.03	13.17	**< 0.001**	**< 0.001**	0.999	**< 0.001**
Vitamin A (µg)	40.32	0.00	532.08	60.32	9.11	168.72	25.85	6.44	109.94	**< 0.001**	**< 0.001**	0.310	**< 0.001**
Vitamin E (mg)	0.39	0.00	1.27	0.68	0.21	1.60	0.77	0.07	2.58	**< 0.001**	**< 0.001**	**< 0.001**	0.668
EPA (g)	0.00	0.00	0.04	0.04	0.00	0.13	0.01	0.00	0.14	**< 0.001**	**< 0.001**	0.851	**< 0.001**
ALA (g)	0.02	0.00	0.11	0.46	0.03	1.49	0.04	0.01	0.15	**< 0.001**	**< 0.001**	0.062	**< 0.001**

PUFA: Polyunsaturated Fatty Acid, SFA: Saturated Fatty Acids, MUFA: Total Monounsaturated Fatty Acids, EPA: Eicosapentaenoic Acid, ALA: Alpha-Linolenic Acid, Note: p[1] = comparison between CeviCal and BeBIS; p[2] = comparison between TürKomp and CeviCal; p[3] = comparison between TürKomp and BeBIS. Decimal points are standardized using dots.

Dietary intake frequencies of 370 healthy individuals were entered into the CeviCal and BeBIS programs. When nutrient components were compared between the two programs, no significant difference was found in carbohydrate percentage ($p > 0.05$), whereas significant differences were observed for all other nutrients ($p < 0.05$). When dietary intake frequencies of 68 healthy individuals were analyzed across CeviCal, BeBIS, and TürKomp, significant differences were found among all nutrient components between the three programs ($p < 0.05$). No significant differences were detected between TürKomp and CeviCal for energy, protein, and fat percentage values ($p > 0.05$), while significant differences existed between BeBIS and these two programs ($p < 0.05$). No significant differences were found between TürKomp and BeBIS for total polyunsaturated and monounsaturated fatty acid values ($p > 0.05$) (Table 3).

A strong positive correlation was found between TürKomp and CeviCal for energy, protein, carbohydrate, and fat values. However, a moderate positive correlation was observed between TürKomp and BeBIS (Figure 2).

4. Discussion

This study used previously collected dietary records with ethical approval to compare two nutrient analysis software programs widely used in Türkiye (CeviCal and BeBIS) . While the focus was primarily on macronutrients, further exploration of micronutrient profiles, including validation through biochemical markers, is warranted. Specifically, the bioavailability of micronutrients, such as vitamins B2, B6, and E, should be considered in further research. The study population primarily comprised healthy young adults (mean age 24.52 ± 5.10 years), which may limit the generalisability of the findings to other age groups or individuals with chronic health conditions.

TürKomp, the Turkish Food Composition Database, was served as the reference standard to assess the consistency and accuracy of the results (Caferoglu et al., 2019; WHO, 2018).

The concept of "ideal nutrition" is a multidimensional phenomenon that varies from society to society and is influenced by various factors, such as health status, age, and ethnicity (Townsend et al., 2023; Venn, 2020). Studies show that nutrition literacy and portion control education have positive effects on individuals' nutritional behaviors (Ertürk Yaşar, 2023). Moreover, comprehensive and up-to-date food composition databases are critically important for both individual dietary assessments and public health policies. Additionally, it has been emphasized that such databases should be further developed as they enhance public awareness and benefit society (Delgado et al., 2021).

Nutrient analysis software is widely utilized in academic research and clinical practice (Caferoglu et al., 2019). However, in this study, significant differences were identified in the nutrient estimates generated by CeviCal and BeBIS. For example, while vitamin C values were similar between CeviCal and TürKomp, BeBIS estimated this value considerably higher. Similarly, vitamin B2 levels calculated based on standardized 100-gram portions were significantly higher in BeBIS than both CeviCal and TürKomp. In addition, vitamin B6 intake derived from dietary records appeared consistent between BeBIS and TürKomp.

Table 3. Analysis of dietary intake frequencies using CeviCal and BeBIS, and CeviCal, BeBIS, and TürKomp programs

	CeviCal (n=370)			**BEBİS (n=370)**				**CeviCal (n=68)**			**BEBİS (n=68)**			**Türkomp (n=68)**						
	Mean	*Min*	*Max*	*Mean*	*Min*	*Max*	*p*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*	*P value*	*P^1*	*p^2*	*p^3*
Energy (kcal)	2102.63	453.58	11154.06	1731.05	424.20	8196.30	**<0.05**	1939.09	453.58	11154.06	1637.11	424.20	8196.30	1926.03	541.24	11075.11	**<0.05**	**<0.05**	>0.05	**<0.05**
CHO (g)	236.75	44.33	1614.34	193.05	42.30	1189.30	**<0.05**	206.78	44.33	1614.34	175.14	42.30	1189.30	187.25	44.54	1423.67	**<0.05**	>0.05	**<0.05**	**<0.05**
CHO (%)	43.97	23.09	78.64	43.93	22.21	105.49	>0.05	41.54	24.64	60.86	41.47	23.54	58.18	37.35	15.97	58.79	**<0.05**	>0.05	**<0.05**	**<0.05**
Protein (g)	73.22	12.33	284.56	65.90	8.40	289.40	**<0.05**	62.80	15.38	284.56	61.18	14.20	289.40	64.70	16.75	200.20	**<0.05**	**<0.05**	**<0.05**	**<0.05**
Protein %	14.32	5.49	28.89	15.27	5.69	40.97	**<0.05**	13.84	8.07	23.57	15.16	9.11	40.97	14.30	7.00	28.63	**<0.05**	**<0.05**	>0.05	**<0.05**
Fat (g)	96.34	22.33	413.54	77.10	16.30	287.70	**<0.05**	94.25	23.87	413.54	75.54	21.60	249.40	95.24	26.15	638.37	**<0.05**	>0.05	**<0.05**	**<0.05**
Fat %	41.85	7.95	65.03	40.37	13.54	70.47	**<0.05**	44.11	19.80	65.03	42.65	26.18	63.33	44.06	21.53	64.73	**<0.05**	**<0.05**	>0.05	**<0.05**
Dietary Fiber (g)	19.73	1.02	89.18	21.35	3.30	111.50	**<0.05**	16.53	3.82	56.88	19.48	4.40	111.50	26.82	6.67	143.72	**<0.05**	>0.05	**<0.05**	**<0.05**
Cholesterol (g)	265.88	18.58	1527.17	284.51	33.60	1331.00	**<0.05**	244.20	18.58	1210.69	264.39	49.90	1150.20	226.64	29.92	1106.98	**<0.05**	**<0.05**	>0.05	**<0.05**
PUFA (g)	11.84	0.54	64.63	14.09	1.60	75.70	**<0.05**	11.86	0.81	64.63	12.79	2.70	53.60	12.06	1.63	108.32	**<0.05**	**<0.05**	>0.05	>0.05
SFA (g)	26.00	3.56	111.78	29.93	5.90	119.60	**<0.05**	26.58	4.88	111.78	29.38	5.90	87.60	21.39	4.13	151.31	**<0.05**	**<0.05**	**<0.05**	**<0.05**
MUFA (g)	22.02	0.98	108.45	26.91	4.20	99.10	**<0.05**	22.64	1.73	98.65	27.33	6.90	89.60	25.90	4.35	207.53	**<0.05**	**<0.05**	**<0.05**	>0.05
Na (mg)	1617.74	173.60	21308.18	1698.76	151.20	8377.70	**<0.05**	1384.28	226.81	5279.00	1535.42	151.20	4254.20	1226.52	161.45	4045.03	**<0.05**	**<0.05**	>0.05	**<0.05**

PUFA: Polyunsaturated fatty acids, SFA:saturated fatty acids, MUFA:Monounsaturated fatty acids Note: p^1 = comparison between CeviCal and BeBIS; p^2 = comparison between TürKomp and CeviCal; p^3 = comparison between TürKomp and BeBIS. Decimal points are standardized using dots

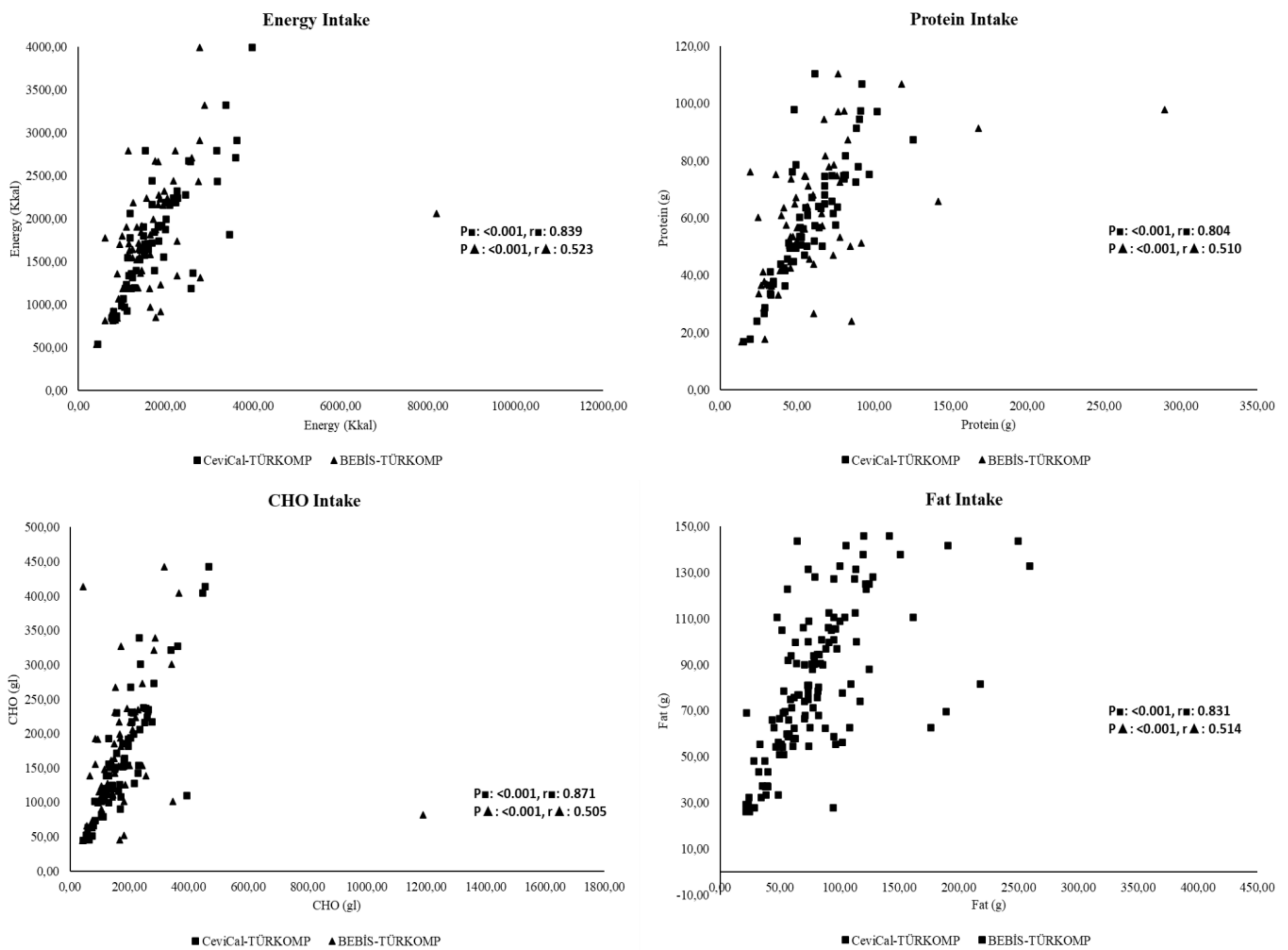

Figure 2. Correlation of nutrient consumption frequencies with energy, protein, carbohydrate, and fat values

The main reason for these differences lies in the content and scope of the databases on which the software is based. BeBIS uses a comprehensive European database that includes many processed and fortified foods. This can lead to higher reported values, especially for micronutrients.

CeviCal, on the other hand, works with a localized database that is more compatible with TürKomp, providing more consistent and nationally appropriate results, particularly for macronutrients. In addition, the user interfaces and data entry systems of the software may also contribute to differences in results:

CeviCal is a newer, web-based platform that enables integrated tracking of nutritional data and information, such as physical activity and medication use. It offers real-time data tracking and personalized feedback features. However, the scope of its database is more limited than that of BeBIS.

BeBIS, in contrast, has a more established and detailed database but lacks personalized and dynamic analysis tools.

Some studies in the literature also support these differences. For example, in studies evaluating the menus of preschool children using BeBIS, the menus were insufficient in meeting nutritional requirements (Yilmaz Akyüz & Sezgin, 2020). In studies conducted with university students, deviations from reference values in energy and fat intake were reported (Garipağaoğlu et al., 2012; Geçim & Terzi, 2023). In another study conducted with university students, the nutrient intake was reported to be in line with reference values (Çakır et al., 2018). In contrast, in a similar study involving medical students who had received nutrition education, fat intake exceeded the TÜBER reference values while energy intake remained below the recommended levels (Garipağaoğlu et al., 2012).

TürKomp posed certain limitations in this study due to including only raw foods and lacking a direct data entry system. These limitations were addressed using a customized Excel format in which cooking losses were calculated using TÜBER data, and recipes were formulated and included. However, this also indicates that TürKomp needs a more integrated and analysis-oriented system. TürKomp was developed by TÜBİTAK using advanced laboratory analysis techniques and complies with international standards (TürKomp, 2015). In a previous study, individuals' vitamin C intake was estimated using the TürKomp database, while plasma ascorbic acid concentrations were determined through High-Performance Liquid Chromatography (HPLC), and a positive correlation was found (Emiroğlu et al., 2020). However, another study comparing in vitro B vitamin content of various bread types found that TürKomp values were significantly lower (Yaman, 2019).

CeviCal showed better alignment with TürKomp in terms of macronutrients and stood out with its user-friendly interface and suitability for clinical use.

Although BeBIS may provide greater accuracy for some micronutrients due to its more comprehensive database, it also carries a risk of deviating from the local context.

These findings suggest that, technical capabilities, study context and database compatibility should address when selecting nutrient analysis software.

Regression models were not applied as this study aimed primarily at comparing agreement between software outputs rather than predicting nutrient outcomes. Further studies may consider multivariate regression analyses. Further studies should include validating these software programs with biochemical markers, testing with broader and more diverse samples, and assessing user experience.

5. Conclusions

No significant differences were observed between CeviCal and TürKomp in terms of macronutrients, such as carbohydrates, proteins, and fats. Similarly, no inconsistencies between BeBIS and TürKomp concerning fatty acids and selected micronutrients were noted. Standardizing portion sizes and conducting analyses based on 100 grams of food yielded highly consistent results in CeviCal. The correlation between CeviCal and TürKomp was stronger than with the other software programs.

Accurate food composition data are critically important for enhancing nutrition awareness and protect public health. Food composition database programs can serve as practical tools for this purpose; however, inconsistencies existing data raise concerns about their reliability. This study showed that the widely used BeBIS and CeviCal programs in Türkiye exhibit some differences when compared with TürKomp data.

As the scope of research expands, it will be possible to address the shortcomings of these programs, leading to more reliable outcomes in public health. Comprehensive studies comparing data from different nutrient analysis software should also be conducted.

Funding Sources

Support was received from the Scientific and Technological Research Council of Türkiye (TÜBİTAK) 2209-University Students Research Projects Support Program.

Previous Presentation

Preliminary results of this study were previously presented as an abstract and orally at the 3rd International Izmir Congress on Medicine, Nursing, Midwifery and Health Sciences, the 10th International Congress on Nutrition Obesity and Community, and the 8th International Acharaka Congress on Medicine, Nursing, Midwifery and Health Sciences.

Declaration of Competing Interest

The authors declare that they have no financial or non-financial competing interests.

Author's Contributions

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B. Uygur (0009-0004-4966-813X): *Writing – Review & Editing, Final Approval.*
B.N. Kafadar (0009-0005-1971-2950): *Writing – Review & Editing, Final Approval.*

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