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The impact of web-based education provided to parents on the nutritional risk of preschoolers: A quasi-experimental study

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Abstract

The purpose of this study was to evaluate the effectiveness of web-based nutrition education for parents of preschool children in reducing nutritional risk. The study was conducted in a one-group pretest–posttest quasi-experimental design. Parents of 3–5-year-old children from 11 preschools in Istanbul participated. They underwent a web-based nutrition education program. The NutriSTEP assessment tool was used to evaluate the nutritional risk score as a pretest assessment, followed by the training program. Posttests were conducted at 1- and 3-month intervals. Before the intervention, 55.8% of the children exhibited high nutritional risk. After the intervention, this percentage decreased significantly at the 1-month and 3-month follow-ups, with 94.2% and 93.6% of the children classified as low risk, respectively. The analysis also revealed significant associations between children's eating behaviours and factors such as maternal education, family income and family structure. As a result, web-based nutrition education was effective in reducing nutritional risk among preschool children. The findings underscore the importance of using technology for nutrition interventions, especially in diverse populations. The training program's simple, short and understandable video increased participants' interest in the training and encouraged regular follow-up.

KEYWORDS

nutritional risk, parent education, parental involvement, preschoolers, web-based education

1 | INTRODUCTION

Nutritional disorders can occur in children as a result of inadequate or unbalanced nutrition. These disorders can adversely affect the healthy growth and development of children. Therefore, nutritional screening aims to identify factors that may affect the nutritional status of children at an early stage and to detect risky diets (Wham et al., 2021). Gaining healthy eating habits in early childhood is important to ensure lasting effects in later ages (Battistini et al., 2020; Buja et al., 2020). Interventions in the environments where children live, learn and play are needed to promote optimal growth, health and development and improve children's nutrition quality (Hendrie et al., 2017). The home environment and parents have a major influence on children's nutrition (Harms et al., 2021). A supportive home environment, easy access to food and encouraging healthy eating habits can positively influence children's nutritional status (Armstrong et al., 2019; Kristiansen et al., 2017).

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Well-designed interventions can help parents make changes in their children's environments (Schlechter et al., 2016). Parents must be supported and involved in planned programs to make lasting changes in healthy eating habits. However, given the challenges of reaching parents, the effectiveness of these programs may be limited (Black et al., 2017; Luesse et al., 2018). Preschools reach many children through their existing infrastructure.

Preschools have the infrastructure to reach children. Because of their easy access to children, they are widely used in programs to improve nutritional status in early childhood. Systematic reviews have found that school-based nutrition programs are moderately effective in improving diet quality, reducing obesity and increasing fruit intake in the short term (Harms et al., 2021; van de Kolk et al., 2019). In most nutrition programs that involved parents, parents tended to be indirectly involved in the program and viewed more as a factor in the program. Studies with direct parental interventions have been found to have more effective outcomes on healthy life behaviours (nutrition and physical activity) compared to previous studies (Verjans-Janssen et al., 2018). Although WHO emphasizes the important influence of parents on children's healthy eating behaviours, there is insufficient evidence to support direct parental involvement in school-based interventions (Langford et al., 2014).

Standard in-person or face-to-face delivery of nutrition education can limit its success in meeting participants' diverse needs and interests, particularly in low-income communities. It lags significantly behind in integrating technological advances (McGuirt et al., 2020). Due to difficulties in reaching parents, face-to-face education has a low success rate in reducing childhood nutrition problems. Web-based nutrition interventions are more feasible due to technological advances and accessibility to individuals in all segments of society. However, research is needed on the effectiveness and acceptability of web-based interventions to inform parents about healthy eating behaviours (Taylor et al., 2016).

This study aimed to evaluate the impact of web-based education provided to parents of preschool children on the children's nutritional risk status. The researchers tested the alternative hypothesis (H1) that web-based education would lead to a decrease in children's nutritional risk scores.

Key messages

- Web-based nutrition education significantly reduced the nutritional risk of preschool children, with high-risk cases dropping from 55.8% to less than 7% at the 3-month follow-up.
- Technology-based programmes offer flexible, accessible and effective solutions for parental involvement in child feeding, particularly in urban areas and at times when face-to-face access is limited.
- Parental education and socioeconomic factors, such as maternal education and family income, were strongly associated with child nutritional risk, highlighting the importance of tailoring interventions to different demographic groups.

2 | METHOD

2.1 | Study design

This study used a one-group pretest–posttest quasi-experimental design to evaluate the effectiveness of a web-based nutrition education intervention for parents of preschool children in reducing nutritional risk. The design included measuring participants' nutritional risk scores before and after the intervention.

Before the implementation of the educational intervention, a pretest using NutriSTEP was administered to assess the baseline nutritional risk level of the participants. After completion of the educational intervention, two posttests were administered at different time points. The first posttest was administered 1 month after the intervention, allowing for an immediate assessment of short-term changes in nutritional risk. The second posttest was conducted 3 months after the intervention to assess the long-term effectiveness and sustainability of the intervention's impact on reducing nutritional risk in preschool children.

2.2 | Study population

The study population consisted of parents with children between the ages of 3 and 5 who can use smartphones/tablets/computers and have access to the Internet, who were enroled in 11 private preschools in Istanbul, Türkiye, and who agreed to participate in the study between June 2022 and January 2023. The districts in which the preschools in the study are located are essential because they are in the top (first) tier of the Turkish Ministry of Industry and Technology's Socioeconomic Development Ranking Survey (SEGE) of districts that are similar in terms of parents' access to the Internet and food. The SEGE ranks districts into six tiers based on socioeconomic development variables: demographics, employment and social security, education, health, finance, competitiveness, innovation and quality of life (Republic of Türkiye Ministry of Industry and Technology, 2019).

The sample of the study consisted of all parents who met the inclusion criteria and agreed to participate in the study without sample calculation, who had 3–5-year-old children enroled in the designated preschools, who could understand and speak Turkish, who were at least literate, who could use smartphones/tablets/computers and who had Internet access. According to the post hoc power analysis performed with 156 parents included in the study, the power of the test (Power, 1-β err prob) = 1.00.

Teachers in the preschools included in the study were interviewed. Teachers were given detailed information about the study. Parents who met the inclusion criteria were informed by their teachers about the

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purpose of the study and how to use the website and were sent a link to the website.

2.3 | Data collection tools

Information form is a descriptive form developed by the researchers to obtain the research data, including 19 questions about the sociodemographic data of the children and their families.

Nutrition Screening Tool for Every Preschooler (NutriSTEP) was developed by Randall Simpson et al. (2008) in Canada, and Azak and Gözen conducted a validity and reliability study in Türkiye (Azak & Gözen, 2024). Parents complete NutriSTEP online by answering questions about their children's diet, physical characteristics, and activities. It is reported that it takes less than 10 min for parents to complete the form. The NutriSTEP consists of 17 questions in four categories: Food and Fluid Intake (Items 1, 2, 3, 4, 5, 6, 9, 10, 13), Physical Growth and Development (Items 8, 16, 17), Physical Activity and Sedentary Behaviour (Items 14, 15) and Factors Influencing Food Intake and Nutritional Behaviour (food insecurity, food environment) (Items 7, 11, 12). Each question has 2–5 options, each with a score ranging from 0 (no risk) to 4 (high risk). The total score is calculated by summing the scores received according to the answer to each question. The higher the total score, the riskier the diet. The total score can range from 0 to 68. According to the NutriSTEP cutoff points, a total score of ≤20 points is considered low risk, 21–25 points is considered moderate risk and ≥26 points is considered high risk.

2.4 | Intervention

2.4.1 | Web-based nutrition education for parents of preschoolers

The original NutriSTEP packaged program was developed by Simpson et al. in Canada (NutriSTEP, 2015). The program includes a measurement tool that assesses the nutritional status of at-risk children and an education section. The NutriSTEP packaged program was translated into Turkish as part of this study. This training was adapted and expanded for the Turkish population according to the guidelines and publications of the Ministry of Health in Türkiye (Ministry of Health, 2013, 2014, 2019a, 2019b, 2022). The Turkish nutrition education training program was finalized in accordance with expert opinions (three dietitians and two academician paediatric nurses).

The nutrition education training program planned for the website consisted of two phases: written and video-based. The written training material included correct answers specific to the 17 items of the NutriSTEP and literature-based information supporting these answers (Ministry of Health, 2013, 2014, 2019a, 2019b, 2022). After the written training step, parents proceeded to the video training step. This step included a total of eight videos, organized according to the four sub-dimensions of NutriSTEP. Each training video lasted an average of 6–10 min for 62 min.

- Food and Fluid Intake—five videos—40:03 min
- Physical Growth and Development—one video—10:43 min
- Physical Activity and Sedentary Behaviour—one video—07:11 min
- Factors Influencing Food Intake and Nutritional Behaviour—one video—09:52 min.

2.4.2 | Website for nutrition education training for parents of preschoolers

Researchers developed a website with expert support to implement the nutrition education training program (https://cocuklardabeslenme.wixsite.com/website). The original website in Canada did not include video-based training and only directed parents to informational resources. In this study, video-based training (https://youtube.com/playlist?list=PLiPIVFIvmfoV6ijPIvSws5FdQV1FLP7is&si=tpH38kprvFi3jV_z) was created to ensure parental participation in education and increase its effectiveness. The website was designed to be accessible on both computers and mobile devices.

The home page included an explanatory text for parents, the purpose of the program, its detailed steps and the researcher's contact information. The second page was titled 'Child and Family Information'. This page included the 'Information Form' and 'NutriSTEP' prepared by the researchers to identify the child's nutritional risk. The third page was titled 'Nutrition Education Program'. The online program contained written and video-based educational modules that parents could access using their e-mail addresses. Parents were evaluated based on the information they provided on the information form. Parents who met the inclusion criteria were given access to the program.

Teachers at the preschools included in the study were interviewed. Parents who met the inclusion criteria were informed by their teachers about the purpose of the study and how to use the website, and the link to the website was sent. Parents who logged on to the website (n = 184) first reviewed the study's topic, purpose and educational steps. After approving the consent form on the second page of the website, parents completed the information form, which included demographic information about themselves and their children, as well as the NutriSTEP pretest questions. The researcher reviewed the pretest questions and approved the enrolment of parents who met the inclusion criteria (n = 184) into the training program. Parents were given 2 weeks to complete the training program. Parents first read the written training. After completing the written training, they completed the video training. If parents left the website without completing the program, they logged in with the same username, and the training continued where they left off. Parents were reminded to complete the program within 2 weeks. Each parent who continued the study watched the videos once and completed the training program. Parents who did not complete the program within 2 weeks had their membership suspended until study data were collected, and these parents were excluded from the study (n = 28). Parents who completed the programme (n = 156) were restricted from accessing it from 2 weeks after their initial access to the training program until the end of the study to avoid influencing the follow-up results at 1 and 3 months. After 4 weeks of watching the videos, parents who completed the training

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program were again sent a link and asked to answer the NutriSTEP questions through the same user registration ($n = 156$). Three months after initial participation, parents were again administered NutriSTEP as a second follow-up (posttest) to evaluate the long-term effectiveness of the educational program ($n = 156$). The pretest refers to the data before the nutrition education program, and the 1st and 2nd follow-ups refer to the data after the training. Upon completion of the study data, access to the nutrition education program was reopened to all parents who participated in the study and those who dropped out. For parents who wished to access further information, links to guidelines published by the Turkish Ministry of Health were added to the website. After the study was completed, the website was made available to the public.

2.5 | Statistical analysis

SPSS 21.0 was used for data analysis. Number-percentage distributions of descriptive information were calculated. The conformity of

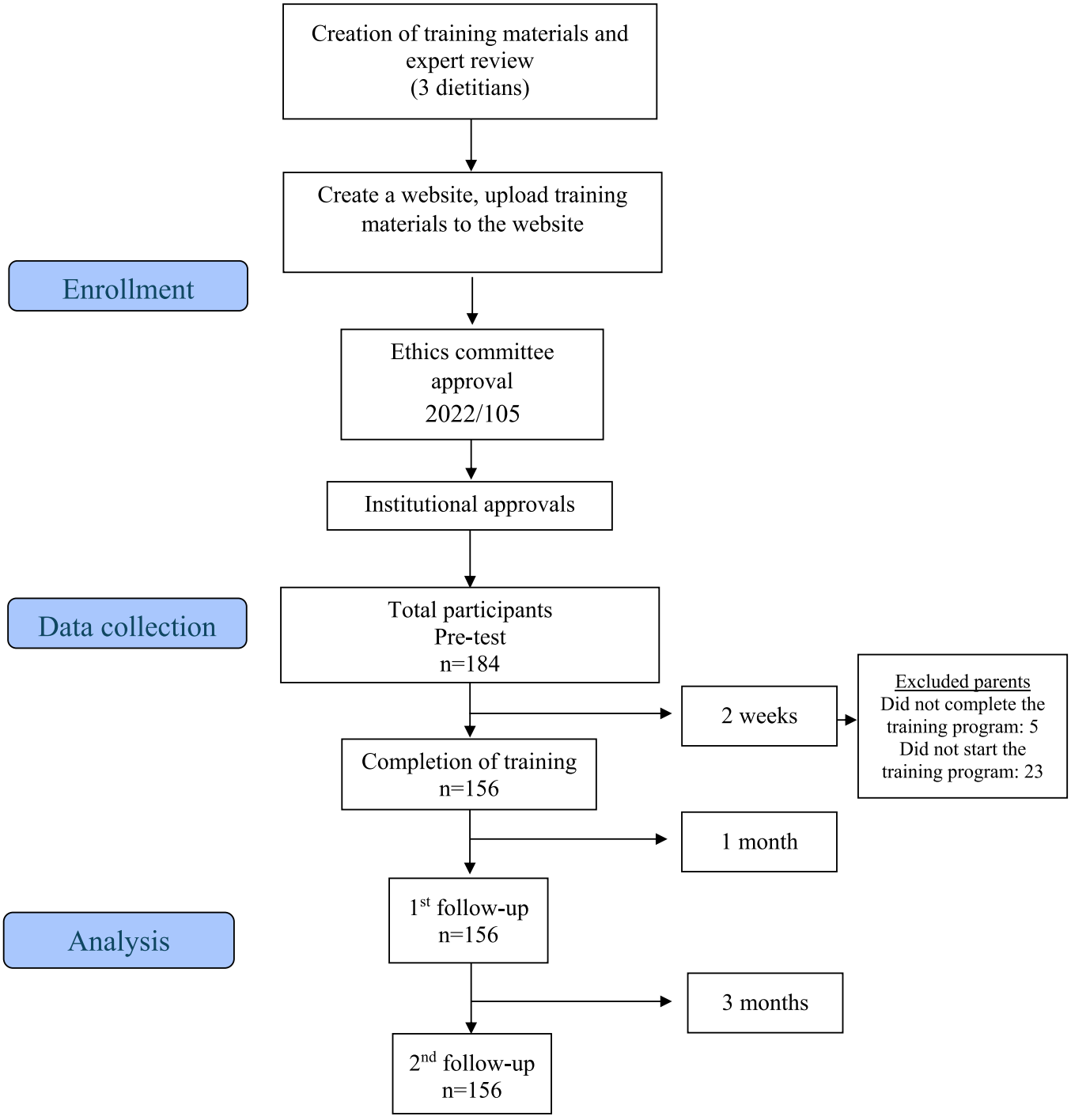


FIGURE 1 CONSORT flow diagram.

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the data to normal distribution was tested by the Kolmogorov–Smirnov normality test (pretest K-S: 0.100; *p*: 0.001; 1st follow-up K-S: 0.106; *p*: 0.000; 2nd follow-up K-S: 0.154; *p*: 0.000). Because the data were not normally distributed, the Mann–Whitney *U* test and Kruskal–Wallis test were used for between-group comparisons, and Friedman's repeated-measures analysis of variance and the Wilcoxon signed-ranks test were used for within-group comparisons (Figure 1).

2.6 | Ethical statement

Ethical approval (2022/105) was obtained from the Social Sciences and Humanities Research Ethics Committee of Istanbul University, Cerrahpaşa, and institutional approval was obtained from the kindergartens where the research was conducted. Parents participating in the study were informed online, and their consent was obtained online.

3 | RESULTS

The mean age of the children included in the study was 3.94 ± 0.85 years; 51.3% were boys and 48.7% were girls (Table 1).

The demographic data of the families are summarized in Table 2.

There was a difference in the mean NutriSTEP scores of the children at the pretest, 1st and 2nd follow-up (x^2: 263.143; *p*: 0.000). At the first follow-up, mean scores were lower than those at the second follow-up, which in turn were lower than the pretest mean scores (Table 3).

While 55.8% of the children were at high risk before the web-based parent education, 94.2% and 93.6% were at low risk at the first and second follow-up visits, respectively (Table 4).

Detailed results of the relationships between variables such as body mass index (BMI), maternal education and employment status, family income, family type and NutriSTEP scores are presented in Table 5. In general, the NutriSTEP scores of children with normal BMI were found to be lower, the NutriSTEP scores of children decreased as the educational level of mothers increased, the scores of children of working mothers were found to be higher and the nutritional risk status of children increased as family income increased.

TABLE 1 Distribution of descriptive characteristics of children (*n* = 156).

Features	Mean	SD
Age (min–max: 3.00–5.00)	4.01	0.82
Features	***n***	**%**
Gender		
Female	76	48.7
Male	80	51.3

TABLE 2 Distribution of descriptive characteristics of families (*n* = 156).

Features	Mean	SD
Mother's age (min–max: 22.00–49.00)	34.89	4.98
Father's age (min–max: 24.00–57.00)	38.20	5.38
Features	***n***	**%**
Number of children in families		
1	72	46.2
2 or more	84	53.8
Mothers' education		
Primary school	3	1.9
Middle school	10	6.4
High school	44	28.2
Bachelor	72	46.2
Postgraduate	27	17.3
Fathers' education		
Primary school	4	2.6
Middle school	15	9.6
High school	51	32.7
Bachelor	65	41.7
Postgraduate	21	13.5
Income status		
Income less than expenses	23	14.7
Income equals expenses	55	35.3
Income more than expenses	78	50.0
Mothers' work status		
Yes	86	55.1
No	70	44.9
Fathers' work status		
Yes	148	94.9
No	8	5.1
Family type		
Nuclear family	115	73.7
Extended family	32	20.5
Single-parent family	9	5.8
Number of individuals living in the family [a](4.03 ± 1.09) (min–max: 2.00–7.00)		
3	55	35.2
4	58	37.2
5 or more	43	27.6

[a]Arithmetic mean ± standard deviation.

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TABLE 3 Comparison of NutriSTEP scores of children before and after web-based education ($n = 156$).

	Mean ± SD	Median (IQR)
Pretest[a]	27.22 ± 6.06	27.00 (10.00)
1st Follow-up[b]	12.58 ± 6.22	12.00 (11.00)
2nd Follow-up[c]	13.61 ± 6.12	13.00 (11.00)
x^2/p 263.143/0.000*. a > c > b**		

Abbreviations: a, pretest; b, 1st follow-up; c, 2nd follow-up.

*$p < 0.05$, x^2: Friedman's one-way repeated measure analysis of variance by ranks.

**The Wilcoxon signed-rank test with the Bonferroni–Holm correction p value $p < 0.0167$.

TABLE 4 NutriSTEP risk status distribution ($n = 156$).

	Pretest		1st Follow-up		2nd Follow-up	
Risk level	*n*	%	*n*	%	*n*	%
Low risk (≤20 point)	22	14.1	147	94.2	146	93.6
Medium risk (21–25 point)	47	30.1	9	5.8	10	6.4
High risk (≥26 point)	87	55.8	0	0	0	0

4 | DISCUSSION

This study provides evidence to support the effectiveness of web-based education provided to parents of preschool children in reducing children's nutritional risk status, thus confirming the hypothesis (H1).

This study showed that the mean age of the mothers (34.89 ± 4.98 years) and fathers (38.20 ± 5.38 years) of the participants was relatively young, and they were found to have lower nutritional risk levels at the pre- and posttraining follow-ups. In addition, a significant proportion of the participating mothers (46.2%) and fathers (41.7%) were university graduates. It was observed that the children of mothers with lower levels of education tended to have higher nutritional risk status compared to those of mothers with higher levels of education. Consistent with the literature, these results highlight the influence of socioeconomic and demographic factors such as family structure, income and parental education on the dietary habits of children and adolescents (Arcila-Agudelo et al., 2019; Papadaki & Mavrikaki, 2015). A study by Houlden et al. reported that individuals who participated in web-based health information were significantly younger and had higher levels of education (Houlden et al., 2021). Previous studies reported that sociodemographic characteristics, socioeconomic status and educational level were associated with online health information research (Li et al., 2015; Stan et al., 2022).

In the current study, children from higher income families showed lower levels of nutritional risk at both pre- and post-training follow-up, which is consistent with the findings of Hermans et al. (2018) and Lee et al. (2017). Hermans et al. (2018) used a nutrition education game, while Lee et al. (2017) focused on tailored nutrition information messages via a smartphone application. Similar to our findings, both studies showed that children from higher socioeconomic backgrounds had reduced nutritional risks (Hermans et al., 2018; Lee et al., 2017).

According to the results of the present study, children with divorced parents had a comparable nutritional risk status both before and after education compared to children living in extended families. Conversely, children living in nuclear families had a lower nutritional risk status (Table 5). Aubel et al. (2021) reported that extended families were effective on mother–child relationships and nutritional attitudes. Long-term increases in child BMI as a result of parental divorce have been reported in the literature. Children with divorced parents are more likely to engage in unhealthy eating (Damigou et al., 2018) and may be at increased risk for overweight and obesity (Goisis et al., 2019).

Compared to the risk level cutoff values that were established by the developers of NutriSTEP in Canada, the risk of Turkish children's nutritional status was above the expected risk level (NutriSTEP, 2015). Considering that the preschools included in the study were selected from the most developed districts according to the level of socioeconomic development (Ministry of Health, 2019c), it can be seen that the risk associated with nutritional status is higher than expected. In the NutriSTEP adaptation study conducted in New Zealand, as in the current study, a high rate (31.6%) was observed in the high-risk group (Wham et al., 2021).

In this study, the rate of children in the high-risk group was 55.8%, and this rate decreased to 0% after education. Among children in the medium-risk group (30.1%), the nutritional risk status decreased to 5.8% at the first follow-up and 6.4% at the second follow-up. The prevalence of overweight and obesity among children is increasing in Türkiye and worldwide. Most parents do not recognize their children's weight problem or consider it a health problem (Peker et al., 2014; Ramos Salas et al., 2021; Savaşhan, 2015). The Ministry of Health of the Republic of Türkiye Ministry of Industry and Technology (2019) has launched an action plan on obesity. A meta-analysis found that half of parents of children aged 2–16 years rated their child's weight as low/normal (Lundahl et al., 2014). Studies conducted in Türkiye show that this rate is even higher. Only 2% of parents with obese children consider their children to be obese, while 33% consider them to be of ideal weight (Peker et al., 2014). In this study, this reduced rate of nutritional risk after the education program suggests that the education increased parents' awareness, which positively impacted children's nutritional risk. It is believed that this increase in parental awareness, facilitated by the education program, played a crucial role in reducing the proportion of children at high nutritional risk.

This study, planned during the pandemic, demonstrated successful retention of 156 participants at the 3-month follow-up due to increased interest in web-based training. It shows that these trainings have a positive impact on child nutrition and enable participants to successfully continue their follow-up. Families in Türkiye have access to the Internet at home, with 94.1% having this capability

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TABLE 5 Comparison of sociodemographic characteristics and NutriSTEP mean/median scores ($n = 156$).

Features	*n*	Pretest		1st Follow-up		2nd Follow-up	
		Mean ± SD	Median (IQR)	Mean ± SD	Median (IQR)	Mean ± SD	Median (IQR)
Body Mass Index (BMI)							
Weak (<5 percentile) (a)	31	31.83 ± 4.53	32.00 (8.00)	17.19 ± 4.06	18.00 (7.00)	17.90 ± 4.18	19.00 (7.00)
Normal (5–85 percentile) (b)	81	22.98 ± 4.33	22.00 (4.00)	8.20 ± 4.75	7.00 (5.00)	9.51 ± 4.96	8.00 (6.00)
Overweight (85–95 percentile) (c)	35	31.20 ± 3.47	31.00 (5.00)	16.91 ± 3.22	18.00 (4.00)	17.74 ± 3.36	18.00 (4.00)
Obesity (>95 percentile) (d)	9	34.00 ± 3.39	34.00 (6.50)	19.22 ± 3.41	20.00 (6.50)	19.66 ± 3.12	20.00 (3.50)
KW/*p*		87.461/0.000*, a = c = d > b***		83.286/0.000*, a = c = d > b**		74.757/0.000*, a = c = d > b**	
Mothers' education							
Primary/Middle school (a)	13	36.46 ± 2.96	37.00 (4.00)	21.30 ± 2.98	20.00 (5.50)	21.61 ± 2.72	20.00 (6.00)
High school (b)	44	32.75 ± 2.87	32.00 (4.50)	18.36 ± 2.32	18.00 (3.00)	19.29 ± 2.27	20.00 (2.00)
Bachelor (c)	72	24.62 ± 3.51	24.00 (5.00)	10.11 ± 4.01	9.00 (6.00)	11.15 ± 4.38	11.00 (6.75)
Postgraduate (d)	27	20.70 ± 3.25	21.00 (6.00)	5.55 ± 3.35	4.00 (6.00)	7.07 ± 3.35	6.00 (6.00)
KW/*p*		110.338/0.000*, a > b > c > d***		107.978/0.000*, a > b > c > d***		102.797/0.000*, a = b > c > d***	
Mothers' age *34.89 ± 4.98 (min–max: 22.00–49.00)							
Under 34 years old	66	25.77 ± 5.59	26.00 (8.00)	11.27 ± 6.03	11.00 (10.00)	12.15 ± 5.93	12.00 (11.25)
34 years and older	90	28.28 ± 6.20	29.00 (10.25)	13.54 ± 6.22	15.00 (11.00)	14.68 ± 6.07	15.50 (11.00)
z/*p*		−2.401/0.016*		−2.244/0.025*		−2.681/0.007*	
Mother's working status							
Yes	86	30.87 ± 5.00	31.00 (6.00)	16.29 ± 5.08	17.50 (5.25)	17.25 ± 4.99	19.00 (7.00)
No	70	22.74 ± 3.85	22.00 (5.00)	8.02 ± 4.12	7.50 (6.25)	9.14 ± 4.07	8.00 (6.25)
z/p		−8.493/0.000*		−8.157/0.000*		−8.201/0.000*	
Income status							
Income less than expenses (a)	23	35.73 ± 3.26	37.00 (6.00)	20.78 ± 3.07	20.00 (5.00)	21.52 ± 2.67	20.00 (5.00)
Income equals expenses (b)	55	30.83 ± 2.83	30.00 (4.00)	16.72 ± 2.54	17.00 (4.00)	17.56 ± 2.69	19.00 (4.00)
Income more than expenses (c)	78	22.16 ± 2.91	22.00 (4.00)	7.24 ± 3.09	7.00 (4.00)	8.50 ± 3.46	8.00 (6.25)
KW/*p*		120.506/0.000*, a > b > c****		118.436/0.000*, a > b > c****		113.702/0.000*, a > b > c****	
Family type							
Nuclear family (a)	115	25.63 ± 5.83	24.00 (7.00)	11.02 ± 6.03	10.00 (10.00)	12.09 ± 5.94	12.00 (10.00)
Extended family (b)	32	31.53 ± 4.31	31.00 (5.75)	17.03 ± 4.36	18.00 (3.75)	17.90 ± 4.42	19.00 (2.00)
Single-parent family (c)	9	32.22 ± 4.11	33.00 (3.00)	16.66 ± 5.07	18.00 (4.50)	17.77 ± 4.57	19.00 (1.50)
KW/*p*		33.032/0.000*, a < b = c****		28.361/0.000*, a < b = c****		27.302/0.000*, a < b = c****	

Abbreviations: IQR, interquartile range; KW, Kruskal–Wallis test; *z*, Mann–Whitney *U* test.

*$p < 0.05$,

***The Bonferroni-adjusted p value $p < 0.008$.

****The Bonferroni-adjusted p value $p < 0.0167$.

(Turkish Statistical Institute, 2022). This high rate can be an advantage for families who have access to web-based education. Recent research has shown that web and technology-based nutrition interventions are attractive and interactive, provide feedback and are flexible and cost-effective (Drapeau et al., 2022). Such interventions can lead to increased engagement in preventing childhood nutrition problems and managing healthy eating behaviours (Drapeau et al., 2022). During the COVID-19 pandemic, interest in web-based interventions has increased due to several barriers to in-person access to traditional nutrition programs (McGuirt et al., 2020).

In a recent study, parents of young children preferred online feeding programs. The study reported that parents were more willing to participate in long-term online interventions than in short-term face-to-face interventions (Boswell et al., 2019). This preference is consistent

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with the findings of our study; attending face-to-face education programs can be challenging for families, especially in large cities such as Istanbul, where access to education is difficult. Parents in the current study found it feasible to participate in the online education program, which they could access at any time within a 2-week period. The importance of this situation becomes clear when you consider that most of the mothers in the study were working and that high-risk groups are more prevalent among children of working parents. All parents were able to log on to the web-based education program whenever they wanted, and after 4 weeks a reduction in high-risk dietary status was observed in the children of all parents. At the long-term follow-up (3 months), the high-risk group was significantly lower than before the training, indicating the long-term effectiveness of the training (Table 5). These results highlight the effectiveness of providing flexible access to web-based training and regular reminders to parents.

The NutriSTEP utilized in the study serves as a direct parent-oriented screening tool, with the training being designed accordingly. Mean pre-training scores for nutritional risk showed a significant decrease at the post-training follow-ups (Table 3). Studies have shown that nutrition initiatives that directly involve parents tend to be more successful than those that indirectly involve parents (Verjans-Janssen et al., 2018). Zarnowiecki et al. (2020) reported that parents were more willing to participate in long-term online interventions compared to short-term face-to-face interventions.

4.1 | Limitations

A limitation of our study is that there was no control group. It was felt that the parents of all children at high, medium and low nutritional risk who participated in the education program should have been included during the same period. At the same time, a control group was not formed out of concern that families of children educated in similar schools might influence each other and lead to significant changes in the results.

4.2 | Strengths

Strengths of this study include the effectiveness of the web-based training program, which was successfully delivered despite being scheduled during the pandemic. The high participation rate and long-term follow-up of the study increase the reliability of the results. In addition, the study's assessment of nutritional risk using a direct parent-focused screening tool and the design of the educational program around this assessment made the results more measurable and meaningful.

5 | CONCLUSION

In conclusion, web-based nutrition education reduced the nutritional risk status of parents' children. The study observed that parents whose children had high nutritional risk scores before the training significantly reduced these scores in the first and third months after the training. It was found that the simple, short and clear video of the training program increased participants' interest in the training and encouraged regular follow-up. However, it is worth noting that it is important to provide ongoing access to parents to maintain the long-term effectiveness of the training. Consistent with these results, it may be recommended to use primary health care services or teachers in schools to provide opportunities for parents to continue nutrition education.

Web-based nutrition education has the potential to reach a large segment of society. Therefore, reaching a wider audience and evaluating the effectiveness of the study in different groups could be a valuable contribution to future studies. In addition, more comprehensive further research may be recommended to investigate the effects of the web-based education program on children's long-term growth and development.

AUTHOR CONTRIBUTIONS

Merve A. and Duygu G. designed the study. Merve A. collected the data. Merve A. and Duygu G. analysed the data. Merve A. and Duygu G. drafted the manuscript. All authors provided critical feedback and read and approved the final manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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