Nutrition Literacy and Its Predictors in Overweight/Obese and Non-Overweight/Obese Adult Turkish Women

ABSTRACT

Background and Objectives: Nutrition literacy has an important role in gaining healthy eating habits and preventing chronic diseases related to nutrition such as obesity. This study aims to determine the level of nutrition literacy of adult Turkish women and its predictors.

Materials and Methods: In this comparative descriptive research, 239 women were selected into 2 groups by their BMI, from Public Education Centers in Istanbul, Turkey, by using simple random sampling method. Data were collected using the Introductory Characteristics Form and Adult Nutrition Literacy Assessment Tool.

Results: Among the participants, 18.8% of women had inadequate, 20.5% had borderline and 60.7% had adequate nutrition literacy. Nutrition literacy scores varied between groups, with 37.3% of overweight/obese women showing inadequate nutrition literacy, while 91.7% of non-overweight/obese women demonstrated adequate literacy. In the study, adequate numerical literacy and food label reading rate of women with overweight/obese was found lower than women without overweight/obese. It was also found that the number of main meals increases the nutritional literacy level in women with overweight/obese. In the overweight/obese group, it was found that nutritional literacy increases 0.333 times by the number of children, 0.369 times by the waist circumference, 0.626 times by the snack amount and 91.166 times by Youtube usage.

Conclusion: The nutrition literacy of both groups was found to be high. This study revealed that number of daily meals and snacks, children, waist circumferences, media usage, and gender roles are preditors of nutrition literacy in Turkish adult women. An important finding of this study is that nutrition literacy is highly affected by YouTube usage which provides a new perspective in terms of public health practices and policies. It is recommended for public health nurses to use this influence of social media when planning health promoting interventions.

Paper Type: Research Article

Keywords: Diet, Health Literacy, Nutrition Literacy, Obesity, Overweight, Women.

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Introduction

Nutrition literacy (NL) refers to the skills and abilities required to prepare food, make healthy food preferences, and understand impacts of diet on health, the environment, and the economy (1). Adequate NL encompasses the ability to read food labels, understand information about nutrients, and control portion size, all which are essential for informed dietary decisions. Research has highlighted that nutritional preferences directly impact health, reinforcing the importance of "right" food preferences and adequate NL (2). NL is affected by age, gender, education level, socioeconomic status, and media usage (3, 4). Media, particularly social media platforms such as Facebook, Instagram, Twitter and Snapchat, is especially impactful due to its pervasive role in daily life and potential to shape nutritional preferences (5, 6).

Inadequate NL can lead to an unhealthy diets and increased risk of overweight and obesity. Gender further influences these risks, as adult women undergo life stages such as menarche, pregnancy, breastfeeding, and menopause, which are associated with hormonal changes and body fat increases (7). Therefore, NL is particularly important for adult women at risk for overweight and obesity, as it plays a crucial role in making informed dietary choices and managing weight (8, 9)

The significance of women's nutrition literacy is also closely tied to traditional gender roles and responsibilities within Turkish society. Although these roles vary by region, tasks such as cooking, grocery shopping, and other household chores are generally expected from women in Turkiye

(10). When the Turkey Family Structure Survey conducted in 2006 is analyzed, it is seen that 87% of women in the family take primary responsibility for cooking and 38% for market shopping. In the 2011 report, these rates had increased to 95% and 74%, and in 2021, the rates were reported as 85.4% and 46.7% (11-14).

Women prepare meals and buy groceries have a ubstantial influence on the food groups and portion sizes consumed by family members including children, spouses, and the elderly in the home. This influence underscores the importance of women's NL as it not only affects their own health but also the dietary habits and nutrition of the entire household. Studies show that women with higher NL positively impact their family's eating behaviours, emphasizing women's critical role in promoting household health (15). The portion size and food choices can vary according to culture, beliefs, and eating habits. However, in many cases, portions and other diet-related decisions are determined by the person who prepares the meals, making the NL of women especially important in Turkish society (16).

Assessing the NL of adult women can provide insights into the broader eating patterns and nutritional habits within their families. Studies indicate that higher NL levels in women are associated with healthier dietary practices and a reduced risk of nutrition-related chronic diseases, including obesity (8). Furthermore, social and digital media platforms have emerged as influential sources of nutrition information with studies showing that media use is positively associated with higher nutrition literacy, empowering women to make informed

dietary choices (9, 17). However, ensuring the credibility of these information sources remains essential, as the quality of nutrition information on social media can vary widely.

Given the crucial role of women in shaping dietary habits within the family, improving their NL could have substantial public health benefits, especially in preventing chronic conditions such as obesity. This study, aims to determine the levels of NL among adult Turkish women according to their Body Mass Index (BMI) and identify its predictors.

Materials and Methods

Study Design

This study is designed as a comparative descriptive research. The target population of the study consisted of adult women living in Istanbul which is one of the most developed and well-known cities in Turkiye (18, 19). Research data were collected from 21 Public Education Centers affiliated with Istanbul Metropolitan Municipality, where various courses are given to women living in Istanbul. Ethics Committee Approval numbered B.08.6.YOK.2.US.0.05.0.06/2018/748 and permission to collect data from Public Education Centers were obtained for the research.

Participants

The sample size of the study was determined using the formula in Figure 1, where N is the population size, p is the estimated proportion of the population (0.64), q is 1−p, Z is the Z-score corresponding to the desired confidence level (1.96 for 95% confidence), and d is the margin of error (0.05) (20). Using this formula, the calculated sample size was 248.

The inclusion criteria for this study were: being a woman aged between 15 and 49,

attending one of the courses in public education centers, and agreeing to participate in the study.

$$n = \frac{N \times p \times q \times Z^2}{(N-1) \times d^2}$$

Fig. 1. Sample size calculation formula

The exclusion criteria were being illiterate or having neurocognitive disorders that could interfere with understanding or completing the survey and assessment tools. The sampling process began with the creation of a comprehensive list of eligible women who were attending courses at the public education centers. Each woman on this list was assigned a unique identification number to facilitate the selection process. The sample group was then selected using a simple random sampling method, where Excel's random number generator function was employed to randomly draw participants from the list. This method ensured that each eligible woman had an equal chance of being selected. After data collection, any incomplete responses were removed from the dataset, resulting in a final sample size of 239 women. These participants were subsequently categorized into two groups—overweight/obese and non-overweight/obese—based on their calculated Body Mass Index (BMI).

Data Collection

The data of the study were collected from adult Turkish women between the ages of 15-49, between May 2019 and August 2019. The scales and forms were distributed and collected by the researcher, meeting the participants face to face. For the participants,

an Informed Voluntary Consent Form including the subject and purpose of the study, the use of personal data, and the contact information of the researcher was prepared and a written informed consent was obtained from the participants.

The data were collected by the researcher using the Introductory Characteristics Form and the Nutrition Literacy Assessment Tool using the face-to-face interview method. The Introductory Characteristics Form was created by the researcher according to the literature (Spronk 2014, Russel 2006). The form consists of 3 domains and 19 questions: 6 questions regarding demographic characteristics, 8 questions regarding general health, and 12 questions regarding nutritional status. The demographic characteristics section comprises six questions addressing: age, education level (options ranging from illiterate to postgraduate degrees), marital status (married, single, and widowed), number of children, employment status (working, not working, and retired), and perceived economic status (options from very good to very poor). The general health section includes eight questions that assess: current height, weight, and waist circumference measurements, smoking habits (current, former, or non-smoker, including frequency and duration), alcohol consumption (current, former, or non-drinker, including frequency and duration), the presence of known chronic diseases, frequency of exercise (ranging from 'never' to 'daily'), perceived current health status (good, moderate, poor), any known illness and details if applicable, and dietary habits related to meal frequency (number of main and snack meals per day). The nutritional

status section comprises 12 questions that cover various aspects of participants' dietary behavior and access to nutritional information. These questions include: who typically performs grocery shopping and meal preparation at home; self-assessment of dietary habits (perception of whether their diet is healthy or not); assessment of nutritional knowledge; sources of nutritional information (e.g., TV/radio, internet, scientific articles); use of social media and specific platforms for obtaining nutritional information; the frequency of reading food and nutrition-related blogs or articles; and reading nutrition-related newspapers, magazines, or books and the types of materials consulted.

The Evaluation Instrument of Nutrition Literacy on Adults (EINLA)

EINLA was developed by Cesur et al (2015) to determine the NL status of adults (21). The validity and reliability study of the tool was done by Cesur in 2015. The Cronbach Alpha reliability coefficient of the tool was 0.75. In this study, the Cronbach Alpha value of the scale was found to be 0.733. EINLA is a knowledge test that evaluates NL with 35 questions in 5 subgroups: general nutrition information, reading comprehension and interpretation, food groups, serving sizes, how to read food labels and ability to do simple calculations. For the evaluation of this instrument each correct answer was coded as 1 point and every unanswered or incorrectly answered items were coded as 0 points. Participants with a total score of 11 and below are considered to have low/inadequate, those with a score between 12 and 23 have a border/risky, and those who

are 24 and above are considered to have good/adequate NL status.

Anthropometric Measurement

Participants' weight, height, and waist circumference measurements were made by the researcher with calibrated weighing and tape measures. BMI was calculated according to WHO recommendations as body weight in kilograms divided by height in meters squared. A BMI value less than 18.5 was evaluated as underweight, 18.5 to 24.9 as healthy weight, over 25 as overweight and over 30 as obesity (22).

Statistical Analysis

The obtained data were transferred to the SPSS (Statistical Package for the Social Sciences) software (IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY, USA; IBM Corp; 2016). The participants were divided into two groups: 124 women with overweight/obesity and 126 women without overweight/obesity, based on their BMI values. The data distribution was evaluated using the Kolmogorov-Smirnov (K-S) test to assess the normality of each variable. For statistical analysis Kruskal-Wallis, Mann-Whitney U, and logistic regression methods were used. The relationship between demographic characteristics, general health information, nutritional characteristics, and NL was evaluated using the logistic regression method [Odds ratios (OR) and 95% confidence intervals]. Two logistic regression models were created to identify the most effective predictors of NL levels in adult Turkish women with and without overweight/obesity.

In this study, logistic regression analysis was employed to evaluate the impact of various predictors on NL levels among adult women. The dependent variable in the logistic regression was NL, categorized into two groups based on the mean total score of the assessment tool: low and high NL. This binary classification allowed us to assess the likelihood of having higher versus lower NL, facilitating clearer interpretations in the logistic model (23, 24).

Categorical predictors that were found statistically significant in prior analyses were included in the logistic regression model to determine their independent effects. For continuous numerical predictors, the results were expressed as odds ratios (OR) with interpretations such as 'one unit increase in the mentioned variable increases the likelihood of high NL by [OR] times' (25). This approach aligns with standard practices in logistic regression, where dependent variables are dichotomized to model binary outcomes effectively (26). A p-value of <0.05 was considered statistically significant for all analyses.

Results

Demographic Characteristics, General Health and Nutrition

In this research, 239 women participated and there was no missing value for any of the variables. Among these women, 121 of them identified as women with overweight or obesity and 118 as without overweight and obesity according to their BMI values. In the first group, the mean age was 46.29±10.94, and in the second group, the mean age was 33.70±12.55.

The results of this study revealed that the median age (p=0.000), number of children (p=0.015), high school graduation (p=0.000), being married (p=0.000), and unemployment (p=0.009) in women with overweight/obesity

women were higher than women without. There was no statistically significant difference between the economic status (p=0.581) and being overweight/obese. Among women with overweight/obesity, the number of smokers (p=0.042), having chronic illnesses (p=0.000), having diabetes (p=0.000) and hypertension (p=0.000), exercising rarely (p=0.043), and perception of a moderate and poor health (p=0.004) were higher compared to women without overweight/obesity.

While women with overweight/obesity have a higher rate of being the person who purchased food (p=0.025) and accessing nutrition-related information through television and radio (p=0.000), in women without overweight/obese group, the rate of accessing nutritional information from scientific journals/articles (p=0.009) and the internet (p=0.000), having a social media account (p=0.000), using a smartphone (p=0.000), reading a blog/post about food and nutrition at least once a week (p=0.012) was found to be higher (Table 1).

Nutrition Literacy

In this study, the overall distribution of NL levels among the participants was as 18.8% of the women demonstrated inadequate NL, 20.5% exhibited borderline NL, and 60.7% had adequate NL. The majority of women with overweight/obesity (37.3%) were found to have inadequate NL whereas women without overweight/obesity (91.7%) had adequate NL. There was no statistically significant difference in general nutrition information (p=0.533), reading comprehension and interpretation (p=0.563), food groups (p=0.999), serving sizes (p=0.956) sections and total NL score (p=0.487) between women with and without overweight/obesity. It was found that women without overweight/obesity had a statistically significant higher rate of adequate NL in how to read food labels and ability to do simple calculations section (p=0.000).

In the logistic regression model, it was found that the total NL score of women with overweight/obesity is increased by 0.333 times by the number of children (p=0.040, 95%, CI=0.118-0.952), 0.336 times by the waist circumference (p=0.058, 95%, CI=0.132-1.033), 0.626 times by the number of snacks (p=0.022, 95%, CI=0.132-1.033) and by 91.166 times by the use of Youtube (p=0.041, 95%, CI=1.201-6919.815). The number of main meals (p=0.012, 95%, CI=1.239-5.578) increased the total NL score of women without overweight/obesity by 2.628 times (Table 2).

Discussion

In line with the changing paradigm of health awareness globally, individuals exhibit a growing tendency to actively participate in decisions and assessments regarding their own health conditions and choices. This increased participatory health perception necessitates a fundamental level of knowledge and analytical ability regarding health-related matters, commonly referred to as health literacy.

NL, as a specialized subset of health literacy, entails the ability to access, process, and comprehend basic nutrition information. Given the direct correlation between nutrition and prevalent issues such as obesity and overweight, particularly among adult women, acquiring accurate nutrition knowledge and interpretive capacity becomes imperative for prevention (27).

Table 1. Introductory Characteristics of Women With and Without Overweight/Obesity

Variable			Women with overweight/obesity N=118		Women without overweight/obesity N=121		p
			n	median	n	median	-6.907a <0.001
Age			118	30.5	121	47	
			n	%	n	%	p
Education Status		Primary school	5	4.2	34	28.3	53.494b <0.001
		Middle School	9	7.6	23	19.2	
		High school	28	23.7	37	30.8	
		University	66	55.9	22	18.3	
		Master/PhD	10	8.5	4	3.3	
Marital status		The married	53	44.9	87	72.5	18.691b <0.001
		Single	65	55.1	33	27.5	
Working Status		Working	45	38.5	35	28.9	2.424b 0.009
		Not working	57	48.7	51	42.1	
		Retired	15	12.8	35	28.9	
Smoking Status		Smoker	39	33.6	31	25.6	6.317b 0.042
		Quit	3	2.6	12	9.9	
		Non-smoker	74	63.8	78	64.5	
Chronic Illness Presence		Yes	17	14.5	54	44.6	25.743b <0.001
		No	100	85.5	67	55.4	
Diabetes Mellitus		Yes	4	3.4	24	19.8	15.620b <0.001
		No	114	96.6	97	80.2	
Hypertension		Yes	6	5.1	28	23.1	15.961b <0.001
		No	112	94.9	93	76.9	
Exercise Status		Never/Rarely	60	51.3	81	67.5	9.841b 0.007
		Several times a week	33	28.2	15	12.5	
		Everyday	24	20.5	24	20.0	
Current Health Status Perception		Good	83	71.6	62	51.7	10.921b 0.004
		Moderate	33	28.4	56	46.7	
		Bad	0	0.0	2	1.7	
The person who does the grocery shopping		She/Herself	70	59.8	89	73.6	5.053b 0.025
		Husband/Children/Parents/Others	47	40.2	32	26.4	
Accessing nutritional information from	TV/Radio	Yes	72	61.5	101	83.5	14.414b <0.001
		No	45	38.5	20	16.5	
	Newspapers and magazines	Yes	30	25.9	28	23.1	0.237b 0.62
		No	86	74.1	93	76.9	
	Internet	Yes	98	83.8	67	55.4	22.544b <0.001
		No	19	16.2	54	44.6	

Variable		Women with overweight/obesity N=118		Women without overweight/obesity N=121		p
Age		n	median	n	median	-6.907a <0.001
		118	30.5	121	47	
		n	%	n	%	p
Journals and articles	Yes	22	18.8	9	7.4	6.782b
	No	95	81.2	112	92.6	0.009
Social Media Account Presence	Yes	111	94.1	87	71.9	20.655b
	No	7	5.9	34	28.1	<0.001
Using a Smartphone	Yes	111	94.1	87	71.9	20.655b
	No	7	5.9	34	28.1	<0.001
Reading a food or nutrition blog	Never	36	31.0	60	50.0	8.889b
	Once a week	27	62.1	53	44.2	0.012
	Everyday	8	6.9	7	5.8	

aZ_{mwu} bχ^2

Table 2. Logistic Regression Analysis of Nutrition Literacy Levels of Women With And Without Overweight/Obesity

	Variables	B	S.E.	Wald	p	OR	%95 CI
Women with overweight/obesity	Number of children	-1.094	0.533	4.213	0.040a	0.335	0.118 - 0.952
	Waist Circumference	-0.997	0.525	3.603	0.058a	0.369	0.132 - 1.033
	Number of snacks	-0.468	0.204	5.271	0.022a	0.626	0.420 - 0.934
	The person who cooks	-4.270	2.386	3.202	0.07a	0.014	0.000 - 1.503
	Using youtube	4.513	2.209	4.173	0.041a	91.166	1.201 - 6919.815
	Constant	-4.939	3.210	2.368	0.12 a	0.007	-
Women without overweight/obesity	Weight	-0.056	0.033	2.850	0.09b	0.945	0.886 - 1.009
	Asthma presence	21.773	40192.818	0.000	1.00 b	2857084382	0.000
	Number of main meals	0.966	0.384	6.337	0.012b	2.628	1.239 - 5.578
	Constant	-20.402	40192.818	0.000	1b	0.000	-

a Modelχ²=12.747;df=1;p=0.048;Nagelkerke R²=0.193
b Modelχ²=10.068; df=3;p=0.018;Nagelkerke R²=0.114

Due to societal gender roles in Türkiye, women often hold the position of primary decision-makers regarding household food procurement and preparation. Therefore, enhancing NL among women also holds the potential benefit of promoting healthier eating habits within the household. This study was conducted to determine the NL levels of adult Turkish women and its predictors.

In this study, the total and subscale NL scores in both groups were found to be high. In a study conducted with 117 individuals of African-American origin, mostly women and overweight/obese, 48% of the participants have "inadequate NL" (28). In another study conducted by Cesur (2018) with 367 adults living in the city center of Sivas, Türkiye, the rate of those who have adequate NL was 79.8% (29). One study conducted in Afyonkarahisar, Türkiye revealed that women had a higher rate of having adequate NL compared to men (15). Although overall NL can be considered high in these studies, there are some differences according to the characteristics of the location and study population. Literacy, specifically NL is known to be influenced highly by factors such as age, gender, education, regional eating habits, food marketing and economic status (30-33).

In this study, BMI was used as a segregating factor to compare the possible predictors of NL. This study revealed that women without overweight and obesity had a higher rate of adequate NL in how to read food labels and the ability to do simple calculations. In another study conducted with mothers, it was also found that the highest score of NL was in reading and understanding of the food labels subgroup (34). In two studies it was also found that the NL levels were higher in the participants with normal BMI values (15, 35). This study provides valuable insights into the NL levels of adult Turkish women, highlighting key differences between those with and without overweight/obesity. The findings align with previous research that indicates a strong link between NL and BMI. For instance, studies have shown that higher NL is associated with healthier eating patterns and lower BMI, emphasizing the role of educational interventions in preventing obesity (35, 36). However, another two studies revealed that there was no statistically significant correlation between BMI values and NL (37, 38). Our results indicate that participants with higher NL levels demonstrated better comprehension of food labels and portion control, consistent with findings reported by Ahmadi and Karamitanha (2023), who noted that mothers with better NL had greater awareness of serving sizes and nutritional content (34). These findings highlight the practical implications of nutritional knowledge in making informed dietary choices, which can help mitigate risks associated with overweight and obesity.

In the regression analysis model, it was found that the high number of main meals increased the total NL of women without overweight/obese. The high levels of NL is associated with the frequency of main meal consumption (36,39). Another finding of this study is that the total NL score of women with overweight/obese is decreased by the increase in the number of children, waist circumference, and the number of snacks daily. The significant impact of demographic and socio-economic variables on NL was evident in this study, mirroring the results of

Mostafazadeh et al. (2024), who reported that age, education, and socioeconomic status were strong predictors of NL (30). As a result of logistic regression analysis in another research conducted by Demir Ozdenk and Ozcebe (2018) with the employees of a university, no significant relationship was found between having a child and the level of NL (16). However, it should also be considered that Demir Ozdenk and Ozcebe's research consists of mostly (67.4%) male participants. Another study conducted with mothers also reported no correlation between the number of children and the NL levels (34). In parallel with our findings, in a study, it was found that waist circumference has a negative correlation with total NL score (37). Another study also reported that individuals with high levels of NL had lower waist circumferences but there was no statistical significance (40).

A novel aspect of our study was the examination of social media's role in shaping NL. As a result of the logistic regression analysis, it was found that using YouTube, increases the NL score of women with overweight/obese. In the study of Zoellner (2009), NL level was significantly associated with media use (9). The use of platforms such as YouTube as a source of nutritional information was associated with higher literacy scores, aligning with Steils & Obaidalahe (2020), who highlighted the dual role of social media in disseminating both reliable and misleading nutritional information (17). This underscores the need for educational strategies that teach critical evaluation skills for online content. Social media is widely used all around the world for various purposes. One of these purposes is to gain nutrition-related information, develop skills by watching food videos and get inspired by the "experts" in these platforms. While social media holds great potential for sharing knowledge and helping individuals to gain healthier behaviors they are accessible to almost every population with very limited supervision. While advancements in scientific knowledge largely shape health literacy, food literacy predominantly emerges from societal influences that operate independently of professional control (17). The findings in this study highlight the importance of the power that social media platforms hold to shape NL.

Study Limitations and Strengths: The research was designed as a comparative descriptive study, forming two comparison groups consisting of an equal number of randomized participants, including women with and without overweight/obesity. This study has several limitations that should be acknowledged. The sample, consisting of 239 women from public education centers in Istanbul, limits the generalizability of the findings to broader populations. The cross-sectional design restricts causal inferences, while the use of self-reported data may introduce bias. Classifying NL into two categories based on mean scores, although practical for analysis, may have reduced data granularity. Excluding illiterate women and those with neurocognitive disorders limits applicability to more vulnerable groups. Additionally, while associations with social media usage were noted, the study did not assess the quality of the information accessed. Based on the findings of this study, it is recommended to develop targeted NL programs tailored to women, particularly those in lower socioeconomic groups, to

support informed dietary choices. Future research should include diverse and vulnerable populations and utilize longitudinal designs to explore causal links between NL and health outcomes. Assessing the quality of nutrition information on social media and teaching critical evaluation skills are essential. Community-based interventions and objective data collection methods, such as food diaries, could enhance the reliability of future studies. Finally, policies promoting nutritional education at local and national levels should be prioritized to prevent nutrition-related chronic diseases.

Conclusion

This study reveals the pivotal role of NL among adult Turkish women, particularly in the context of overweight and obesity. The findings underscore the significant impact of factors such as the number of daily meals and snacks, children, waist circumferences, media usage, and gender roles on NL levels. Notably, women without overweight/obesity demonstrated higher NL in certain aspects, emphasizing the importance of tailored interventions. Furthermore, the study highlights the influence of social media, notably YouTube, in shaping NL, presenting an avenue for targeted educational strategies. These insights not only contribute to the understanding of NL dynamics but also emphasize the need for multifaceted approaches to enhance health literacy among diverse populations.

Availability of data and materials: The datasets analyzed during the current study are available from the corresponding author upon reasonable request.

Conflict of interest: No potential conflict of interest was reported by the authors.

Consent for publication: The authors hereby give consent for publication of the manuscript.

Ethics approval and consent to participate: This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethics Committee Approval was obtained from Uskudar University (Approval Number: B.08.6.YOK.2.US.0.05.0.06/2018/748), and permission to collect data from Public Education Centers was granted. An Informed Voluntary Consent Form was provided to each participant, detailing the study's purpose, use of personal data, and contact information for the researcher. Written informed consent was obtained from all participants before data collection.

Authors' Contributions: EHKC contributed to the study design, data collection, data analysis and manuscript writing. MNE contributed to data analysis, interpretation and critical revision of the manuscript. Both authors read and approved the final manuscript.

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