JOURNAL OF NUTRITION FASTING AND HEALTH

Factors Affecting Food Waste Management Behavior in Iran: A Systematic Review Based on Behavioral Theories

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ARTICLEINFO

Article type:
Review Article

Article History:
Received: 24 May 2024
Accepted: 26 Jan 2025
Published: 21 Jun 2025

Keywords:
Food waste
Iran
Systematic review
Theory

ABSTRACT

Introduction: Food waste in Iran is approximately six times higher than the global average, posing significant challenges to food security, the environment, and economic sustainability at regional, national, and international levels. Despite substantial evidence on consumer behavior in waste management, limited knowledge exists regarding the factors influencing food waste management behavior in Iran. This systematic review identifies and analyzes these factors based on behavioral theories.

Methods: A comprehensive search was conducted across five databases—PubMed, Scopus, Web of Science, ScienceDirect, and Magiran—to identify cross-sectional studies examining food waste behavior through the lens of behavioral theories. Studies published in English from inception to October 2022 were included. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) framework guided the identification, screening, and inclusion of studies in this review.

Results: Out of 14 screened articles, four met the eligibility criteria and were included in the study. The behavioral theories applied in these studies were the Theory of Planned Behavior (TPB), the Theory of Reasoned Action (TRA), and the Social Cognitive Theory (SCT). The most commonly identified predictors of food waste behavior were attitudes, perceived behavioral control, and subjective norms. Additionally, enhancing food waste reduction skills emerged as a valuable strategy to increase perceived control and individuals' ability to adopt sustainable food waste management practices.

Conclusions: The key constructs of attitude, subjective norms, and perceived behavioral control from the Theory of Planned Behavior (TPB) significantly predict food waste management behavior. However, incorporating an expanded version of TPB may yield a more significant impact on behavior modification.

► Please cite this paper as:
Fatemi SF, Charoghchian Khorasani E, Namkhah Z, Afzal Aghaee M, Peyman N. Factors Affecting Food Waste Management Behavior in Iran: A Systematic Review Based on Behavioral Theories. J Nutr Fast Health. 2025; 13(3):157-163. DOI: 10.22038/JNFH.2025.79696.1511.

Introduction

Food waste (FW) encompasses both edible and inedible portions of food that require disposal or recycling (1). It also refers to food lost at various stages of the food supply chain, including harvesting, production, processing, distribution, and consumption (2, 3). Approximately 1.3 billion tons of edible food are annually wasted globally (4), with nearly 50 million tons lost in the eastern Middle East subregion (5). In Iran, where 85% of the food supply is derived from agriculture, 35% is wasted, amounting to 28 million tons—a figure nearly six times higher than the global average (6). The adverse consequences of food waste pose significant threats to economic development, environmental sustainability, public health, food safety, and food security (7). Since more than 800 million people worldwide suffer from hunger and malnutrition (8, 9), preventing and reducing FW is a critical strategy for fostering a sustainable food system and mitigating environmental impacts (10). Consequently, behavioral changes at both individual and collective levels are essential for reducing FW. Despite numerous studies, the determinants of

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FW generation remain a topic of ongoing debate (11, 12). Moreover, FW is a complex behavioral phenomenon influenced by multiple factors and motivations. Therefore, identifying an appropriate conceptual framework to explain FW behavior is crucial (13). Behavioral theories, such as Social Cognitive Theory (SCT), the Theory of Planned Behavior (TPB), and the Theory of Reasoned Action (TRA), provide valuable insights into FW management behaviors and serve as foundational models for designing and implementing effective intervention strategies (14-17).

Therefore, this study aimed to examine the extent to which behavioral theories have been utilized to investigate food waste (FW) management and identify the key constructs that predict FW-related behaviors. Accordingly, this systematic review was conducted to determine the factors influencing FW management behavior based on behavioral theories in Iran.

Materials & Methods

Study Design

This systematic review was conducted under the PRISMA guidelines (13). Ethical approval was not required since the study relied solely on secondary literature sources.

Search Strategy

A comprehensive systematic search was conducted across five electronic databases: PubMed, Scopus, Web of Science, ScienceDirect, and Magiran. The same search strategy was applied uniformly across all databases, covering records published from inception until October 2022. The search terms included a combination of Medical Subject Headings (MeSH) and non-MeSH terms as follows: ("domestic waste" OR "food loss" OR "food waste*" OR "kitchen waste*" OR "leftovers" OR "lost food" OR "plate waste*" OR "wasted food") AND ("theory of planned behavior*" OR "theory of reasoned action" OR "TPB" OR "TRA" OR "planned behavior*" OR "social cognitive theory" OR "reasoned action") AND (Iran*). To ensure comprehensive coverage and minimize the risk of missing relevant studies, we manually searched all eligible studies' reference lists and related review articles.

Initially, two researchers independently screened the titles and abstracts of the retrieved references. In cases of disagreement, a chief investigator was consulted to resolve discrepancies. Full-text evaluation and data extraction were performed for studies that met the inclusion criteria. Studies lacking full-text availability in English or not peer-reviewed were excluded.

Inclusion and Exclusion Criteria

Studies were included in this review if they were conducted in Iran, published in English, available in full text, and addressed food waste. The eligibility assessment was performed by screening the retrieved articles' titles, abstracts, and full texts. Review articles and duplicate studies were excluded.

Data Extraction and Quality Assessment

Validated quality assessment tools were used to evaluate the studies (18), incorporating seven criteria to assess selection bias, measurement bias, and analysis bias: (1) clear definition of the target population; (2) representative sampling of potential respondents; (3) adequate response rate; (4) standardized data collection methods; (5) use of reliable survey instruments; (6) use of valid survey instruments; and (7) appropriate data analysis. The total quality score ranged from 0 to 7, based on responses of "Yes" (scored 1) or "No" (scored 0) (Table 2). Two authors (S.F.F and Z.N.) independently assessed all selected studies for this systematic review, with a third author consulted to resolve any discrepancies in the assessment results.

Table 1. Articles included in the review.

	Author, Year Country	Population	Age Mean or range	Sample Size	Design of study	Items measuring	Measurement	Assessment
1	Bijan Abadi/2020 /Kermansha h(17)	All wholesalers of Kermanshah city.	Wholesale rs aged 22 and above Male (n=265), Female (n=0)	265	Cross-sectional	TPB variables a Cultural factors: (-Egalitarian personality -Fatalistic personality -Individualistic personality -Hierarchical personality) -Facilitators/impediments	Likert	The waste management of fruit and vegetable in wholesale markets
2	Ava Heidari/201 9/ Mashhad(15)	A person from a household	Participan ts aged 22 and above	382	Cross-sectional (A case study)	TPB variables a Moral attitude -Perceived ascription of responsibility	A 5-point Likert scale (from	Household food management

	Author, Year Country	Population	Age Mean or range	Sample Size	Design of study	Items measuring	Measurement	Assessment
			Male (n=132), Female (n=242)			-Marketing addiction -Waste-preventing behavior	1=strongly disagree to 5=strongly agree).	
3	Amir H Pakpour/2013/ city of Qazvin(14)	A person from a household	Age ranged from 20 to 68 years Male (n=660), Female (n=1122)	1782	Cross-sectional	TPB variables [a] Moral obligation Self-identity Action planning Past recycling behaviour	A 5-point Likert scale (from 1=strongly disagree to 5=strongly agree) Action planning: (from 1=totally disagree, to 5=totally agree) Past behaviour (from 1=never, to 5=frequently/at every collection)	Household waste behaviours
4	Fatemeh Soorani/ 2018/ Yasouj(16)	A person from a household	Age ranged from 15 to 64 years	405	Cross-sectional	TPB variables [a] Feeling of guilt	A 5-point Likert scale (from 1=strongly disagree to 5=strongly agree)	Food consumption management behavior (- Shopping routine, - Reusing leftover routine, - Food storage routine)

[a] TPB variable: attitudes, perceived behavioral control, subjective norms, and intention; [b] PBC: perceived behavioral control; [C] SN: subjective or social norms

Table2. Quality assessment of the reviewed article

	Title of Paper	Defining clearly the target population	Sampling is representative of potential respondents	Adequate response rate	Standardized data collection methods	Reliable survey instruments	Valid survey instruments	Analyzing the data appropriately	Result of quality assessment
1	The waste management of fruit and vegetable in wholesale markets: Intention and behavior analysis using path analysis	1	1	1	1	1	1	1	7
2	A theoretical framework for explaining the determinants of food waste reduction in residential households: a case study of Mashhad, Iran	1	1	0	1	1	1	1	6
3	Household waste behaviours among a community sample in Iran: An application of the theory of planned behaviour.	1	0	1	1	1	1	1	6

Results

The primary search identified a total of 14 articles. One article was excluded due to duplication, and seven studies were removed for not meeting the inclusion criteria. Consequently, six studies remained for full-text screening, of which two were excluded for lacking the required information. Ultimately, four studies, comprising data from 2,834 participants, met all inclusion criteria and were included in this systematic review. Figure 1 presents the PRISMA flowchart of the search process.

The selected studies were conducted in four cities: Mashhad, Kermanshah, Qazvin, and Yasuj. Table 1 provides a summary of the included studies.

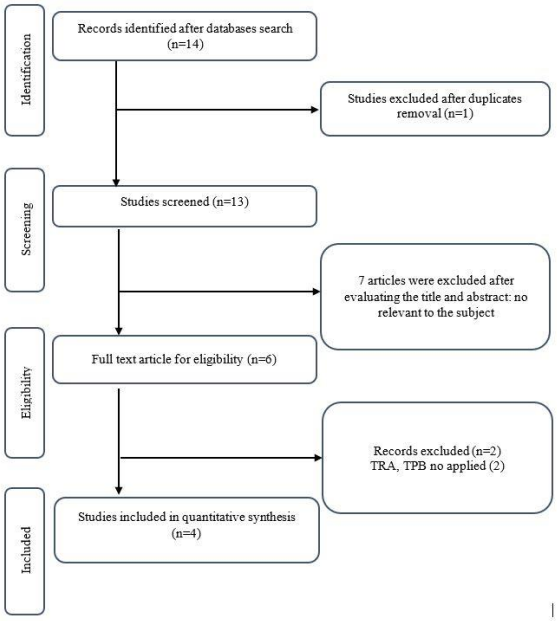

Figure1. Flowchart of study selection for inclusion trials in the systematic review.

Discussion

Based on behavioral theories, this study aimed to identify the factors influencing food waste management behavior in Iran. The findings revealed that, according to the inclusion criteria of this review, the Theory of Planned Behavior (TPB) is the only behavioral theory applied in food waste management studies in Iran. In contrast, other behavior change theories have not been utilized. The TPB constructs of attitude, subjective norms, and perceived behavioral control predicted food waste management behavior. However, when TPB is applied in an expanded form, its predictive power increases significantly. Incorporating additional constructs such as guilt, marketing addiction, the perceived ascription of responsibility, moral attitude, waste-preventing behavior, moral commitment, self-identity, action planning, past recycling behavior, and the cultural theory of risk (individualistic and hierarchical characteristics) enhances the model's explanatory capacity and effectiveness in food waste management behavior.

A review study by Raghu et al. (19) indicated that most research on solid waste recycling has been conducted using the Theory of Planned Behavior (TPB). Similarly, in our study, most of the reviewed research focused on TPB. However, while our review was limited to studies conducted in Iran, Raghu et al. (19) did not impose any geographical restrictions and examined solid waste recycling more broadly.

Additionally, Etim et al. (20) systematically analyzed the factors influencing household food waste behavior based on TPB. Their findings highlighted the importance of targeting attitudes, subjective norms, and perceived behavioral control for effectively reducing household food waste, which aligns with our results. However, unlike our study, which focused solely on Iran, Etim et al. (20) examined food waste behavior across 17 countries, employing a broader search scope.

Srivastava et al. (21) conducted a review study to introduce the concept of a systematic literature review with meta-analysis to examine the application of the Theory of Planned Behavior (TPB) in food waste behavior research. A total of 26 studies were analyzed. The findings revealed that the most substantial relationship between attitude and behavioral intention was observed. In contrast, the relationships between subjective norms and perceived behavioral control with intention emerged later.

All reviewed studies were conducted in Iran, applying either the original, an adapted, or an extended version of the Theory of Planned Behavior (TPB). The research focused on factors influencing household food waste management

(14-16) and waste management in wholesale fruit and vegetable markets (17). Within the TPB framework, attitude (14-17), perceived behavioral control (PBC) (14-17), and subjective norms (14-17) Individuals ' food waste management intentions were identified as the most frequent predictors. Additionally, several extended constructs were recognized as influencing FW management behavior, including feelings of guilt (16), moral attitude, waste-preventing behavior, perceived ascription of responsibility (15), past behavior, moral obligation, self-identity, action planning (14), and personality-related traits such as individualistic, hierarchical, and fatalistic characteristics (17). All studies utilizing the TPB model confirmed that attitude plays a significant role in shaping food waste management behavior (14-17). Attitude toward behavioral intention refers to an individual's favorable or unfavorable evaluation of a behavior (18). Accordingly, attitudes toward food waste reduction were assessed by evaluating individuals' desire and willingness to minimize food waste.

Three studies found that attitude has a significant positive effect on household food waste management in Iran (14-16). The findings indicate that individuals with a positive attitude toward the environment and the importance of food waste reduction are more likely to exhibit stronger intentions to minimize food waste. However, this influence is partially mediated by subjective norms and attitudes (15). Additionally, another study demonstrated that attitudes toward food waste management positively impact behavior (17). Specifically, attitudes play a crucial role in shaping waste management practices in the wholesale fruit and vegetable sector. Attitudes toward waste management directly influence how fruit and vegetables are supplied and consumed. Wholesalers with positive attitudes toward food waste management are more likely to acknowledge its significance, voluntarily adopt more efficient behaviors, and implement waste reduction strategies. Consequently, by actively reducing waste and maintaining sustainable management initiatives, organizations are more likely to achieve long-term waste reduction goals (22).

Perceived behavioral control (PBC) refers to an individual's perception of the ease or difficulty of reducing food waste (16). Studies have shown that PBC significantly influences the intention to reduce household food waste (14-16) as well as fruit and vegetable waste management (17).

Subjective norms (SNs) represent the social support or pressure exerted by influential groups, such as family and friends, in shaping an individual's behavior. In other words, SNs reflect what people perceive as acceptable or unacceptable behavior at a given moment (23). If significant others disapprove of food waste, individuals are likelier to eliminate the practice. All reviewed studies emphasized the importance of understanding the role of subjective norms in shaping food waste reduction intentions (14-17). Positive responses to social influences from significant individuals strengthen intentions to reduce food waste—particularly in fruit and vegetable waste management (17). Conversely, when individuals receive negative feedback from others, some may exhibit rebellious tendencies, resisting behavioral change (17).

The studies assessed in this review identified several additional constructs influencing food waste management behavior. These include perceived responsibility, moral obligation, self-identity, intention, action planning, and past behavior (14); waste-preventing behavior and perceived responsibility (15); guilt (16); and individualism, hierarchical personality, and fatalism (17). These factors serve as significant predictors for enhancing food waste management practices.

Moral obligation refers to an individual's judgment of whether a behavior is morally right or wrong (23). Developing educational materials that emphasize moral obligation and action planning may be beneficial in promoting responsible food waste management. Action planning involves specifying when, where, and how an individual will act based on their intentions, serving as a voluntary, post-intentional process (23). Research suggests that strategies emphasizing individuals' intrinsic and moral motivations for recycling can effectively enhance household waste reduction efforts (24).

One of the most significant predictors of the intention to reduce food waste is waste-preventing behavior, which includes activities such as waste reuse, minimization, and recycling (15).

The findings of this review indicate that food waste can induce feelings of guilt, which, in turn,

motivates individuals to reduce food waste and engage in pro-environmental behaviors (27).
Additionally, individualism has been found to influence attitudes toward fruit and vegetable waste management (17). In highly individualistic societies, flexibility and adaptability to environmental changes are valued, and adjusting to these changes is considered essential for disaster prevention and maintaining ecological balance (27, 28). Individualists tend to favor competitive and innovative market-driven solutions over government intervention in achieving equilibrium within markets (28, 29). Conversely, fatalism negatively impacts attitudes toward food waste management (17), as fatalists believe that natural forces operate beyond human control, leading to the perception that human efforts have little influence on waste reduction (28). On the other hand, hierarchical personality traits have a positive impact on attitudes toward fruit and vegetable waste management (17). Individuals with a hierarchical worldview perceive nature as controllable and are more likely to support structured waste management efforts, emphasizing expertise, leadership, regulation, and forecasting as key drivers of effective waste reduction strategies (26, 27).
This is the only study in Iran that has examined the factors influencing food waste management behavior. Despite our extensive efforts to employ multiple search strategies and select eligible studies, it is possible that some relevant studies were unintentionally overlooked. Similarly, as with any research, we acknowledge the possibility that certain studies may have omitted key factors in their findings, potentially affecting validity and precision. Consequently, we cannot draw definitive conclusions about these associations. However, our findings provide valuable insights and may serve as a foundation for future research.

Conclusion

The findings of this study indicate that, based on the inclusion criteria, the Theory of Planned Behavior (TPB) is the only theoretical framework applied to food waste management research in Iran. Within this model, the constructs of attitude, subjective norms, and perceived behavioral control were identified as key predictors of food waste management behavior. However, when TPB is applied in an expanded form, its predictive power is significantly enhanced by incorporating additional constructs such as guilt, marketing addiction, perceived ascription of responsibility, moral attitude, waste-preventing behavior, moral commitment, self-identity, action planning, past recycling behavior, and the cultural theory of risk (individualistic and hierarchical characteristics). Therefore, educational interventions for food waste management can be effectively designed and implemented using an extended version of TPB, incorporating these additional constructs to foster more sustainable waste reduction behaviors.

Declarations

Conflicts of Interest

The authors declared no conflict of interest.

Funding

The study was supported financially by Mashhad University of Medical Sciences (Grant No. 4011015).

Ethical Considerations

This study is based on a research project approved by Mashhad University of Medical Sciences (Project Code: IR.MUMS.REC.1400.185).

Authors' Contributions

Conceptualization, N.P., and S.F.F.; methodology, S.F.S., and M.A.A.; writing—original draft preparation, S.F.S., and Z.N.; writing—review and editing, S.F.S., E.Ch.Kh, and Z.N. All authors have read and agreed to the published version of the manuscript.

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