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Assessment of Environmental Health Indicators in Restaurants of Mehran City in 2026

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A B S T R A C T

Introduction: Environmental health indicators in food preparation and distribution centers are of critical importance due to their direct impact on consumer health. Environmental health experts are responsible for overseeing sanitation standards in public facilities, such as restaurants. Given the pivotal role of health indicators in improving the quality of services provided to customers, this study aimed to assess the environmental health status of restaurants in Mehran—a major transit hub for Arbaeen pilgrims and travelers visiting the holy shrines—in 2026.

Materials & Methods: This descriptive cross-sectional study was conducted using a census method on all 13 active restaurants in Mehran. Data were collected through observation, interviews with managers, and the completion of the standard Ministry of Health and Medical Education sanitation inspection checklist (form code:101/920318). The collected data were analyzed using Excel software.

Results: The findings indicated that the compliance rates with regulations for personal hygiene, food hygiene, equipment hygiene, and building safety were 76.37%, 77.33%, 73.28%, and 69.23%, respectively. Notable deficiencies included: lack of valid health cards (46.15%), lack of valid food hygiene training certificates (61.54%), failure to implement self-control and self-reporting systems (100%), inadequate waste management and pest control measures (53.85%), and substandard restroom facilities for staff and customers (61.54%).

Conclusion: To improve environmental health indicators in the studied restaurants, it is essential to foster continuous interaction between restaurant owners and environmental health inspectors, conduct regular training courses, and implement systematic supervision. Furthermore, health authorities should prioritize the establishment of self-control and self-reporting protocols and collaborate with regulatory bodies to address these non-conformities and ensure food safety.

Keywords: Environmental Health, Restaurant, Mehran City, Ilam

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Introduction

Food safety and hygiene, as defined by the Food and Agriculture Organization (FAO), encompass the principles and measures aimed at preserving food integrity throughout the supply chain to ensure consumer protection. Food safety programs are designed to ensure compliance with sanitary regulations, facilitate the production of safe food, and prevent foodborne diseases (1). Restaurants, particularly those located along high-traffic routes serving travelers, represent critical environments that require rigorous monitoring for food quality and safety (2). Failure to maintain sanitary standards in such public establishments poses significant risks, as these centers not only serve as hubs for the transmission of communicable diseases but also facilitate the nationwide dissemination of pathogens by mobile populations (3). Food and waterborne diseases are major global public health concerns, encompassing over 2,000 acute and chronic conditions (4, 5). This burden persists in both developing and developed nations; according to the World Health Organization (WHO), approximately 1.8 million deaths occur annually due to food and water-related illnesses (6). In the Persian Gulf region, governments and consumers are increasingly concerned with food safety in restaurants, with pathogens such as Salmonella, Bacillus cereus, and Staphylococcus aureus frequently detected in local food samples (7). Previous studies indicate that restaurants are susceptible to elevated levels of cross-contamination due to inadequate cleaning and disinfection protocols (8, 9). Key contributors to foodborne illnesses include the use of unsafe raw ingredients, undercooking, improper holding temperatures, poor personal hygiene among staff, unhygienic equipment, and high turnover rates of kitchen personnel. According to the U.S. Centers for Disease Control and Prevention (CDC), approximately 58% of foodborne outbreaks are attributed to food prepared outside the home in food service establishments, such as corporate kitchens, hospitals, and nursing homes (6). Continuous and precise assessment of contamination in food preparation and distribution centers is vital for preventing infection transmission and safeguarding public health. Enhancing sanitary techniques and providing ongoing training for staff and the public—especially during crisis scenarios—places a significant responsibility on decision-makers to ensure food safety and consumer trust through rigorous inspections (10). Environmental health inspectors, in addition to their educational and consultative roles, are responsible for strictly supervising infrastructural and sanitary standards (e.g., adequate space, proper lighting, ventilation, flooring and wall tiling, sewage systems, waste management, and hygienic practices in food production, storage, and distribution). In cases of non-compliance, inspectors initially issue verbal warnings to allow for improvement; however, if violations persist, cases are referred to competent authorities for legal action in accordance with established regulations (11). Various studies have evaluated environmental health indicators in restaurants (11-16). Results from a study by Dehghani et al. (2019) in Baft, Iran, indicated that among the assessed personal hygiene items, the lowest compliance rate pertained to mandatory trade training courses, with only 37.5% of restaurant managers and staff having completed them. Furthermore, 50% of the restaurants exhibited poor personal hygiene standards, and Fisher's exact test revealed no significant correlation between the completion of trade training and the sanitary performance of food preparation and distribution centers across the studied indices (4). In a study conducted by Khanjari et al. (2023) regarding the sanitary status of university restaurants in Tehran, findings indicated that aerobic bacterial counts exceeded permissible limits on 44% of contact surfaces. Furthermore, a complete concordance (100%) was observed between Staphylococcus aureus contamination in food samples and on the hands of food handlers, confirming the role of personnel hands as a primary transmission vector. Ultimately, this research emphasized the necessity of

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implementing food safety management systems in Tehran University restaurants (6). Similarly, Nejad Shahbodaghi et al. (2016) reported that despite adherence to personal and environmental hygiene protocols in kitchens and the possession of health cards by staff, significant challenges persisted. Key weaknesses identified included inadequate sanitary facilities, lack of segregation between organic and inorganic waste, and non-compliance with the use of gloves and head coverings by employees. According to the authors, improving the sanitary status of the studied restaurants requires systematic waste management, rigorous supervision of personal hygiene, and the promotion of a safety culture among staff (16). Environmental health indicators in food preparation and distribution centers must remain a constant priority due to their direct correlation with consumer health (4). Given that restaurants serve diverse populations on a daily basis, they must maintain sanitary characteristics suitable for public use (15). Considering the strategic location of Mehran as a major transit hub for Arbaeen pilgrims and travelers to the Holy Shrines, the region experiences exceptionally high human traffic, exerting immense pressure on service infrastructures, particularly food preparation and distribution centers. Since the health of pilgrims is directly linked to the environmental hygiene of these facilities, any deficiency in sanitary protocols could trigger a chain of foodborne disease outbreaks. Despite this high level of sensitivity, no comprehensive or systematic studies have been conducted to monitor the environmental health status of these centers. Therefore, the present study was conducted to evaluate the environmental health status of restaurants in Mehran in 2026.

Materials and methods

In this descriptive-cross-sectional study, a census method was employed to investigate all 13 active restaurant units within the city of Mehran. Necessary data were collected through direct observation, interviews with facility managers, and the completion of a standardized sanitary inspection checklist (Form Code: 101/920318), developed by the Iranian Ministry of Health and Medical Education. The checklist comprised 66 items categorized into four dimensions: personal hygiene (14 items), food hygiene (20 items), equipment and utensil hygiene (19 items), and building hygiene (13 items) (17). The collected data were analyzed using Microsoft Excel. To determine the sanitary status of each checklist dimension and to calculate the percentage of compliance and non-compliance of the studied indicators with the official regulations, the following formula was applied (17, 18):

$$\text{Compliance rate with sanitary regulations (\%)} = \left(\frac{\text{Frequency of compliant data}}{\text{Total frequency of data}}\right) \times 100$$

Results

Tables 1 to 4 present the results of the environmental health indicators for restaurants in Mehran, categorized into personal hygiene, food hygiene, equipment and utensil hygiene, and building hygiene and safety.

Regarding personal hygiene, the results indicated that the absence of health certificates and public health training certificates accounted for 46.15% and 61.54% of non-compliance with regulations, respectively. Additionally, 38.46% of the managers and staff lacked clean, intact aprons and appropriate headgear (Table 1).

Table 1. Status of personal hygiene indicators among restaurant workers in Mehran city in 2026

Row	Parameter	Compliance with Regulation (%)	Non-compliance with Regulation (%)

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1	Use of disposable gloves in case of wounds, cuts, and blisters*	100	0.00
2	Proper hand washing*	100	0.00
3	Valid health card	53.85	46.15
4	Prohibition of tobacco product sales	100	0.00
5	Nail hygiene	100	0.00
6	Prohibition of unauthorized persons entering the kitchen	76.92	23.08
7	Prohibition of tobacco use by personnel	76.92	23.08
8	Informing about the prohibition of tobacco use	76.92	23.08
9	Clean and healthy hair	61.54	38.46
10	Clean and proper clothing for other staff	61.54	38.46
11	Use of hairnets/caps	61.54	38.46
12	Having a designated area for storage of personal belongings	84.62	15.38
13	Posting hand-washing guidelines	76.92	23.08
14	Valid health training certificate	38.46	61.54

* Critical Parameter

In the food hygiene section, non-compliance with the principles of sanitizing vegetables and tubers, as well as improper handling and transportation of food, was observed in 15.38% of the studied units. Additionally, discrepancies regarding temperature standards in refrigerators, freezers, and cold storage were evident in 38.46% of the units according to the regulations. Furthermore, the processes of self-control and hygienic self-declaration by owners, as well as sampling based on self-control and self-declaration instructions, were not implemented in any of the studied units (Table 2).

Table 2. Status of food hygiene indicators in restaurants of Mehran city in 2026.

Row	Parameter	Compliance with Regulation (%)	Non-compliance with Regulation (%)
1	Sanitizing vegetables and salad greens*	84.62	15.38
2	Food transportation and handling*	84.62	15.38
3	Proper cooking temperature for food*	100	0.00
4	Refrigerator, freezer, and cold storage temperature*	61.54	38.46
5	Cold chain and proper food storage temperature*	61.54	38.46
6	Hygienic conditions for ice storage*	-	-
7	Hygienic conditions for egg storage*	100	0.00
8	Segregation of food from detergents and chemicals	100	0.00
9	Prohibition of illegal additives, dyes, and flavors	100	0.00
10	Separation of raw and cooked food (red and white meat, etc.)	76.92	23.08
11	Prohibition of using illegal decorative materials	100	0.00
12	Proper food packaging	76.92	23.08
13	Proper thawing of frozen food	92.31	7.69

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14	Self-control and self-declaration by the owner	0.00	100
15	Sampling based on self-control and self-declaration	0.00	100
16	Necessary food specifications	84.62	15.38
17	Suitable spice containers	84.62	15.38
18	Necessary requirements for disinfectants and sanitizers	92.31	7.69
19	Recording food entry dates in the refrigerator	76.92	23.08
20	Necessary requirements for self-service tables	92.31	7.69

* Critical Parameter - Not Applicable

In the section regarding the hygiene of tools and equipment, the critical parameter concerning the sanitary condition of refrigerators, freezers, and cold storage was compliant with the regulations in only 61.54% of the studied units. Furthermore, in this section, non-compliance with regulations was reported in 53.85% of cases regarding the proper washing of utensils and the sanitary condition of cutting boards, and in 46.15% of cases regarding the stainless-steel property and sanitary condition of worktables, display cases, and shelves (Table 3).

Table 3. Health Status of Tools and Equipment in Restaurants of Mehran city in 2026.

Row	Parameter	Compliance with Regulation (%)	Non-compliance with Regulation (%)
1	Functional refrigerator, freezer, and cold storage*	61.54	38.46
2	Dishwashing sink equipped with hot and cold water*	100.00	0.00
3	Dishwashing sink	76.92	23.08
4	Separate sink for handwashing	76.92	23.08
5	Proper dishwashing method	46.15	53.85
6	Use of paper cartons and packaging	76.92	23.08
7	Clean and intact tableware	76.92	23.08
8	Clean and intact equipment	76.92	23.08
9	Material and specifications of tableware	76.92	23.08
10	Prevention of air pollution	100.00	0.00
11	Rust-free and intact work tables	53.85	46.15
12	Cutting board	46.15	53.85
13	Dough mixer	76.92	23.08
14	Rust-free and intact showcases and shelves	53.85	46.15
15	Clean and intact tables and chairs	84.62	15.38
16	First aid kit	76.92	23.08
17	Visible display of sanitary status	76.92	23.08
18	Compliance with sanitary status and inspections	76.92	23.08
19	Complaint hotline/contact number	76.92	23.08

* Critical Parameter

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In the building hygiene and safety section, the status of the water supply system was compliant with the regulations in 100% of the studied restaurants. However, non-compliance was evident in 53.85% of the units regarding parameters of the waste collection and disposal system, as well as necessary measures for pest and rodent control, and in 61.54% of the units regarding the condition of restrooms for both staff and customers (Table 4).

Table 4. Health and Safety Status of Restaurant Buildings in Mehran city in 2026.

Row	Parameter	Compliance with Regulation (%)	Non-compliance with Regulation (%)
1	Water supply system*	100.00	0.00
2	Sewage collection and disposal system	76.92	23.08
3	Waste collection and disposal system	46.15	53.85
4	Pest and rodent control	46.15	53.85
5	Staff restrooms	38.46	61.54
6	Customer restrooms	38.46	61.54
7	Break room	76.92	23.08
8	Condition of bathrooms	-	-
9	Kitchen wall covering	69.23	30.77
10	Kitchen floor covering	69.23	30.77
11	Kitchen ceiling covering	76.92	23.08
12	Dining hall floor, wall, and ceiling	76.92	23.08
13	Food storage room floor, wall, and ceiling	76.92	23.08
14	Cold storage room floor, wall, and ceiling	-	-
15	Intact and rust-free doors and windows	84.62	15.38
16	Temperature and humidity	69.23	30.77
17	Lighting	76.92	23.08
18	Ventilation	69.23	30.77
19	Shelving and palletization	76.92	23.08
20	Separation of raw and cooked food	76.92	23.08
21	Hygiene and facade conditions	-	-

* Critical Parameter - Not Applicable

In the present study, the levels of personal hygiene, food hygiene, tool and equipment hygiene, and restaurant building hygiene and safety in Mehran city in 2026 were compliant with the regulations at 76.37%, 77.33%, 73.28%, and 69.23%, respectively. Furthermore, the overall compliance rate with environmental health regulations in the studied units was assessed at 74.05% (Figure 1).

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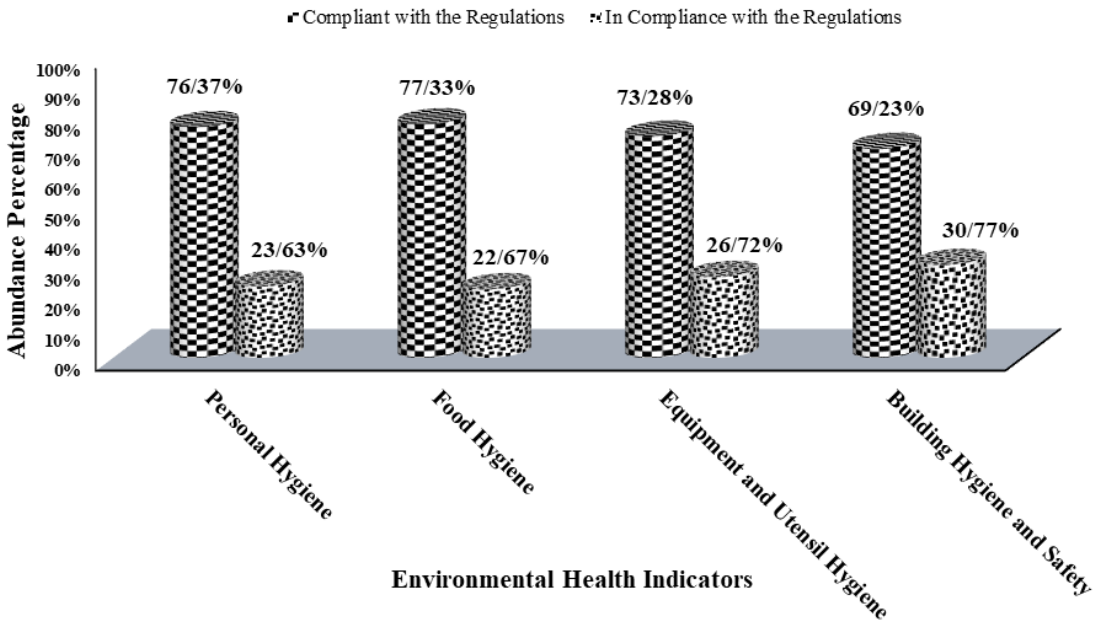

Figure 1. Overall status of environmental health indicators in restaurants of Mehran city in 2026.

Discussion

The present study aimed to evaluate environmental health indicators in restaurants in Mehran city, categorized into four domains: personal hygiene, food hygiene, tool and equipment hygiene, and building hygiene and safety.

Regarding personal hygiene, the findings revealed significant non-compliance with regulations: 46.15% of restaurants lacked valid health cards, and 61.54% lacked certified training certificates. Additionally, 38.46% of personnel did not utilize appropriate and clean protective clothing, such as aprons and caps. These results are consistent with the study by Deghani et al. (2019) in Baft, where non-compliance rates for health cards and general hygiene training certificates were 13% and 62.5%, respectively (4). Similarly, Sadeghi et al. (2011) in Mashhad reported that only 2.92% of staff held valid health cards, despite 46.33% having participated in vocational training (3). In the current study, respondents identified forgetfulness, costs, and time consumption as primary barriers to obtaining health cards and training. This suggests a significant gap in the perceived importance and mandatory nature of hygiene certification among restaurant staff. Therefore, environmental health inspectors should play a more proactive role in referring and guiding staff toward obtaining health certificates and participating in specialized public health training sessions. Proper personal hygiene, including hand and nail hygiene and the use of clean, light-colored protective clothing, remains essential. Compared to the findings of Sadeghi et al. (3), where only 23.05% of personnel wore appropriate work attire, and Soleimani et al. (2022) in Qazvin, where 70% of units maintained adequate attire (19), the hygiene status in Mehran shows significant room for improvement.

In terms of food hygiene, 15.38% of the studied restaurants failed to adhere to proper protocols for vegetable sanitization and food transportation/handling, while 38.46% failed to maintain standard temperatures in refrigerators, freezers, and cold storage. These findings align with Deghani et al. (2019), who reported improper food handling and transportation in 37.5% of restaurants in Baft (4). Furthermore, while Soleimani et al.

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(2022) found that 75% of kitchens in Qazvin maintained proper temperature control (19), and Zozoli et al. (2012) reported a 20% failure rate in vegetable washing in Qaemshahr (20), the results in Mehran highlight persistent challenges in cold chain management and food preparation. Increasing awareness among food handlers and strengthening inspector oversight during preparation, transport, and storage is crucial to reducing the incidence of foodborne diseases (4). Notably, the current study found a complete absence of self-control and self-declaration processes in all surveyed restaurants. This lack of implementation may stem from the unavailability of authorized self-control companies in Mehran. As Mirzai et al. (2023) noted in Darreh Shahr, implementing self-control and self-declaration processes is essential and can only be achieved through the active follow-up of health authorities (21).

Regarding the hygiene of tools and equipment, the study revealed that the functional status of refrigerators, freezers, and cold storage units was non-compliant with regulatory standards in 46.38% of the cases. The malfunction of cooling equipment, such as refrigerators, leads to an inability to maintain required temperatures during food preparation and distribution, which can severely compromise food hygiene. This finding is supported by the research of Chezen et al. (2005) in Indiana, which demonstrated that a failure to maintain the cold chain transforms perishable food items, such as meat, into significant breeding grounds for pathogenic bacteria (22). Interestingly, this contrasts with the study by Deghani et al. (2019) in Baft, where the storage of perishable foods in refrigerators met regulatory standards in 97% of the observed cases (4). It is evident that implementing corrective measures, such as repairing or replacing malfunctioning refrigeration units, is essential to prevent cold chain disruptions in the studied units.

Furthermore, findings related to tool and equipment hygiene indicated that 53.85% of the units exhibited deficiencies in proper utensil washing and cutting board hygiene, while 46.15% showed inadequacies in the sanitary condition and stainless-steel integrity of worktables, display cases, and shelves. In comparison, Zozoli et al. (2012) reported that 90% of units in Qaemshahr possessed sanitary and washable tables (20). However, Soleimani et al. (2022) in Qazvin found that only 50% of the studied units maintained adequate conditions for worktables, cutting boards, and utensil washing (19). The sanitary deficiencies observed in the current study can be mitigated through rigorous follow-up with owners and consistent inspections by environmental health professionals. As suggested by Zangiabadi et al. (2009) in Isfahan, increasing the frequency of inspections and minimizing the intervals between visits is directly correlated with a reduction in environmental health issues within restaurants (11).

In terms of building hygiene and safety, the water supply system showed the highest level of compliance, with a frequency of 100%. This is critical, as the use of contaminated water in food preparation can facilitate the transfer of pathogens to food, endangering consumer health. This finding aligns with the study by Rabbani et al. (2015) in Kashan, where all surveyed hotels and guesthouses maintained 100% compliance regarding safe water supply (15). Despite the integrity of the water supply, significant non-compliance was observed in waste collection and disposal systems (53.85%) and pest control measures (53.85%), as well as in the sanitary condition of restrooms for both staff and customers (61.54%). These results stand in contrast to Deghani et al. (2019), who reported higher compliance rates in Baft for waste disposal (85.2%), pest control (84.11%), and restroom sanitation (75%) (4). Similarly, Soleimani et al. (2022) noted that pest and rodent control measures were fully implemented in all studied units in Qazvin (19). Improper waste disposal can lead to the accumulation of pests and rodents, thereby compromising public health and causing nuisance to customers. Therefore, addressing non-compliance in waste management and restroom

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sanitation must be prioritized by regulatory authorities.

Overall, the compliance rates with regulatory standards in Mehran for personal hygiene, food hygiene, tool/equipment hygiene, and building hygiene were 76.37%, 77.33%, 73.28%, and 69.23%, respectively. When compared to Deghani et al. (2019), who reported non-compliance rates of 62.5% for equipment and 12.5% for building hygiene (4), and Soleimani et al. (2022), who reported significantly higher compliance rates across all domains (73.86% for personal, 80.65% for food, 81.04% for equipment, and 73.64% for building hygiene) (19), it is clear that the restaurants in Mehran face more substantial challenges. Achieving optimal environmental health standards in restaurants is of paramount importance due to their direct impact on community health.

Conclusion

The present study demonstrated that the overall compliance rate with environmental health regulations in Mehran's restaurants was 74.05%. The most critical deficiencies identified include the lack of valid health certificates and specialized public health training for staff, inadequate hygienic attire, substandard food storage and sanitization practices, and hygiene lapses in tools and equipment, particularly regarding utensil washing and the sanitation of work surfaces. Furthermore, significant challenges were observed in building hygiene and safety, specifically in waste management, pest and rodent control, and the sanitary condition of restrooms.

These non-compliances substantially elevate the risk of foodborne disease transmission and threaten the overall public health of the community. Addressing these gaps necessitates a multi-faceted approach driven by effective collaboration between diverse stakeholders. Synergistic cooperation between restaurant owners and environmental health inspectors is vital; inspectors must transition toward a more proactive role by providing continuous education, consistent information dissemination, and conducting frequent, unscheduled inspections to incentivize compliance.

Moreover, there is an urgent need to implement and institutionalize self-control and self-declaration processes within the food service sector, a transition that requires dedicated follow-up from health authorities. Finally, inter-sectoral collaboration among regulatory bodies—such as the Ilam University of Medical Sciences and the Organization for Supervision of Public Places—is imperative to ensure the effective enforcement of regulations, enhance the environmental health standards of restaurants in the region, and ultimately guarantee the safety of consumers.

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Ethics approval

This study was approved by the Ethics Committee of Ilam University of Medical Sciences (Iran) (IR.MEDILAM.REC.1404.206). The authors avoided data fabrication, falsification, plagiarism, and misconduct.

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Conflict of interest

There is no conflict of interest between authors.

Authors' contributions

CConceptualization, Methodology, Validation, Formal Analysis, Investigation, Resources, Software, Writing–Original Draft Preparation, Visualization, Supervision, Project Administration: AA, ZM, Data Curation: ZM and Writing–Review & Editing: AA.

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