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From Mechanism to Behavior: Mushroom-Oriented Dietary Practices and Self-Reported Health in a Cross-Sectional Survey

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Abstract. More and more evidence supports the microbiota-mediated health potential of mushroom- and plant-derived bioactives. This study examined mushroom-oriented dietary behaviors in a cross-sectional survey of 52 participants. Behavioral measures demonstrated good internal consistency (Cronbach's $\alpha = 0.74$), which indicates a coherent pattern of functional dietary engagement. Notably, individuals aged 26–35 showed significantly higher mushroom-oriented behavior scores ($p = 0.028$). This finding suggests that young adults may be particularly attentive to traditional health-supportive dietary practices. The survey captured patterns of mushroom consumption, diversity of mushroom types, and use of medicinal mushroom products and related traditional foods to further characterize these behaviors. These measures allowed exploratory evaluation of how functional dietary engagement appears in everyday eating habits within contemporary populations. Observations help contextualize the demographic pattern identified in the overall analysis. While clear symptom-level differences were not observed, the findings highlight a generational trend. This trend integrates medicinal mushrooms and food–medicine homology products into modern health-conscious lifestyles.

Keywords: Mushroom, Functional dietary pattern, Health-conscious lifestyle

1. Introduction

It is increasingly improtant to understand how diet shapes human health and requires an integrated perspective linking bioactive compounds, gut microbiota, and immune regulation. Growing evidence suggests that many plant- and fungus-derived molecules exert their physiological effects not primarily through direct absorption, but through microbial transformation in the gut. Zhang et al. demonstrated that low-bioavailability compounds such as saponins and polysaccharides must be metabolized by intestinal bacteria into smaller bioactive metabolites that subsequently regulate inflammation and immune responses [1]. Similarly, Liu et al. reported that mushroom polysaccharides—including β-glucans—support gastrointestinal homeostasis by enriching beneficial taxa, increasing short-chain fatty acid production, and strengthening epithelial barrier function [2]. Together, these findings support a model in which dietary bioactives influence host health via microbiota-mediated mechanisms.

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Yunnan one of the world's major biodiversity hotspots, provides a uniquely relevant context for examining these relationships. It contains more than 19,000 species of higher plants [3]. It also lies at the intersection of major floristic regions. This ecological diversity parallels a rich ethnomedicinal tradition. Ethnobotanical studies among the Yi, Lisu, Hani, Miao, and other groups document extensive use of medicinal dietary plants. These are consumed as both food and health-supporting materials [4, 5]. Species such as Panax notoginseng, Dendrobium officinale, and numerous edible medicinal mushrooms contain saponins, polysaccharides, and polyphenols known to interact with gut microbial and immune pathways. This biological plausibility is reinforced by recent experiments. Mo et al. showed that notoginseng saponins are transformed by gut microbes into more potent metabolites with anti-inflammatory effects [6]. Zhou et al. demonstrated that D. officinale polysaccharides improve microbial balance and reduce inflammatory cytokines [7]. Yang et al. reported enhanced immune responses and altered gut flora following D. nobile supplementation [8]. Zhang et al. further documented metabolic regulatory effects of Panax notoginseng components [9].

Although there are some strong mechanistic supports, little is known about real-world consumption patterns or whether self-reported gastrointestinal and immune experiences align with these proposed mechanisms. Therefore, the present study conducted a structured questionnaire survey to examine mushroom-oriented and medicinal dietary behaviors, associated symptoms, and knowledge–attitude–practice profiles. By connecting laboratory evidence and lived dietary behavior, this study provides preliminary human population data to inform future translational and public health research.

2. Methods

2.1. Study design and participants

This study used a cross-sectional survey design to examine mushroom-oriented dietary behaviors. It also explored their potential associations with self-reported gastrointestinal and immune-related experiences. 52 participants completed an anonymous online questionnaire voluntarily. The survey collected demographic information, including age group, gender, primary place of residence, and highest level of education. Participation was voluntary and all responses were self-reported and anonymized.

2.2. Assessment of mushroom-oriented dietary behaviors

Mushroom-oriented dietary behaviors were assessed using seven survey items that captured both frequency and intentional engagement. These included frequency of edible mushroom consumption (Q07), diversity of mushroom types consumed (Q08), medicinal mushroom product use (Q09), consumption of Yunnan specialty mushrooms (Q10), herbal or medicinal tea intake (Q11), tonic product use (Q12), and intentional purchase of food–medicine homology products (Q13). Ordinal responses were numerically coded to reflect increasing frequency or degree of engagement, and binary items were coded as 0 or 1.

To evaluate whether these behaviors formed a coherent dietary pattern, a standardized Behavior Cluster Score was constructed by z-score normalizing and averaging the seven items. Internal consistency of this composite was assessed using Cronbach's alpha. In addition, a focused Mushroom Behavior Score was created using four mushroom-specific indicators (Q07, Q08, Q09, and Q10) and was used for demographic association analyses. For group comparison analyses,

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participants were categorized into High and Low mushroom behavior groups using a median split of this composite score.

2.3. Assessment of gastrointestinal and immune outcomes

Gastrointestinal outcomes were assessed using items Q17–Q24. These measured the frequency or severity of bloating, constipation, diarrhea, postprandial discomfort, bowel irregularity, food sensitivity, abdominal pain, and overall gastrointestinal comfort. Immune-related outcomes were measured using items Q25–Q31. These included frequency of colds or upper respiratory infections, rhinitis-like symptoms, skin allergy symptoms, perceived immune weakness, stress-related susceptibility to illness, recovery speed after illness, and recurrent infections requiring rest. Ordinal responses were numerically coded according to increasing frequency or symptom severity. Exploratory composite scores were calculated by averaging relevant items to generate a GI Score and an Immune Score for group-level analyses.

2.4. Statistical analysis

Internal consistency of behavioral composites was evaluated using Cronbach's alpha. Associations between demographic variables and mushroom-oriented behavior were examined using linear regression models with categorical predictors. Nonparametric tests, including Kruskal–Wallis tests and Mann–Whitney U tests, were used for group comparisons where appropriate. Chi-square tests were applied to evaluate associations between categorical variables. Effect sizes (Cohen's d) were calculated to aid interpretation of group differences. Statistical significance was defined as $p < 0.05$. Given the exploratory nature of the study and the modest sample size, effect sizes were also reported to provide additional context for interpretation.

3. Results

3.1. Participant characteristics and behavioral adoption patterns

A total of 52 participants completed the survey. Age distribution was relatively balanced across categories, with the largest subgroup being 26–35 years old (Figure 1A). With respect to functional dietary practices, 42.3% of participants reported having consumed medicinal mushroom products at least once, while 57.7% reported never consuming such products (Figure 1B). Additionally, 67.3% indicated at least some intentional purchase of food–medicine homology products (Q13; Figure 1C), suggesting substantial behavioral adoption of traditional dietary health practices within the sample.

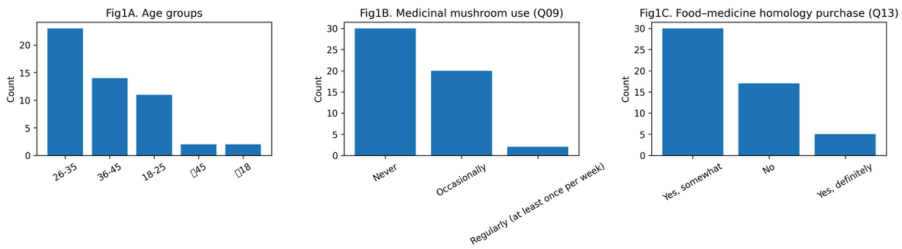

Figure 1. Demographic distribution and mushroom-oriented dietary behaviors

Age distribution of survey participants. (B) Proportion of participants reporting medicinal mushroom consumption. (C) Engagement in food–medicine homology products. These panels

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illustrate the prevalence and demographic spread of functional dietary practices within the sample.

3.2. Mushroom-oriented dietary behavior forms a coherent pattern

To assess whether mushroom-related practices represent a unified behavioral construct, we constructed a standardized Behavior Cluster Score incorporating frequency of mushroom intake (Q07), diversity of mushroom types (Q08), medicinal mushroom consumption (Q09), Yunnan specialty mushroom exposure (Q10), herbal tea intake (Q11), tonic product use (Q12), and food–medicine homology purchases (Q13). This composite demonstrated good internal consistency (Cronbach's $\alpha = 0.74$), indicating that these behaviors form a coherent mushroom-oriented dietary pattern (Figure 2A).

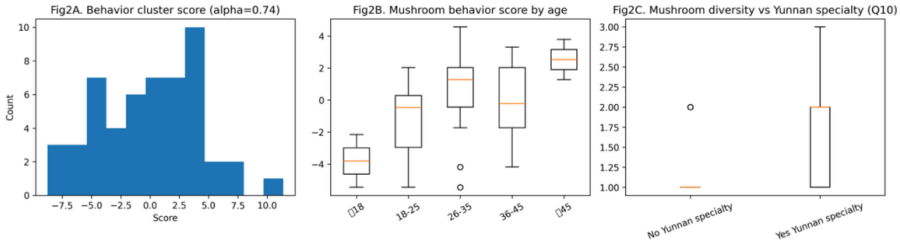

Figure 2. Structure and demographic predictors of mushroom-oriented dietary behavior

(A) Internal consistency of the behavioral composite (Cronbach's $\alpha = 0.74$), indicating a coherent dietary pattern. (B) Mushroom behavior scores by age group, showing significantly higher engagement among participants aged 26–35 ($p = 0.028$). (C) Association between mushroom diversity and Yunnan specialty mushroom exposure ($p = 0.026$).

3.3. Age and residence predict mushroom-oriented behavior

We examined demographic correlates of mushroom-specific behavior (frequency, diversity, medicinal use, Yunnan specialty exposure). A simplified linear regression model including age group and residence significantly predicted Mushroom_behavior_score ($F = 2.93$, $p = 0.017$, $R^2 = 0.28$). Participants aged 26–35 showed significantly higher mushroom-oriented behavior scores compared to the reference group ($\beta = 2.08$, $p = 0.028$) (Figure 2B). A trend-level association was observed for residence in Tier 1 cities ($\beta = –1.19$, $p = 0.107$), suggesting lower engagement in highly urbanized populations. Additionally, mushroom diversity (Q08) was higher among individuals reporting consumption of Yunnan specialty mushrooms ($p = 0.026$) (Figure 2C), indicating that mushroom-oriented dietary behaviors show clear demographic patterning.

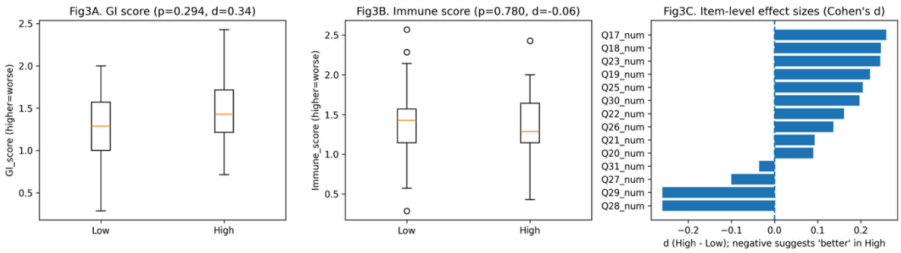

Figure 3. Exploratory comparisons of gastrointestinal and immune outcomes by mushroom behavior group

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Gastrointestinal composite scores in High vs. Low mushroom behavior groups. (B) Immune composite scores by group. (C) Item-level effect sizes across gastrointestinal and immune measures. No statistically significant symptom-level differences were observed.

3.4. No significant associations with gastrointestinal or immune outcomes

Given strong mechanistic evidence linking mushroom-derived bioactives and gut–immune modulation, we examined whether higher mushroom-oriented dietary behavior corresponded with differences in self-reported gastrointestinal or immune experiences. Participants were categorized into High and Low mushroom behavior groups using a median split (High: n = 23; Low: n = 29). Mean gastrointestinal symptom scores were slightly higher in the High group (1.43) than in the Low group (1.27), but the difference was not statistically significant ($p = 0.294$; Cohen's $d = 0.26$) (Figure 3A). Immune composite scores were similarly comparable (High: 1.39; Low: 1.42; $p = 0.781$; Cohen's $d = –0.06$) (Figure 3B). Item-level analyses showed small effect sizes across immune perception measures, but none reached statistical significance (Figure 3C; $|d| < 0.30$).

4. Discussion

This study explored how mushroom-focused and food-medicine homology dietary habits manifest in modern society. As predicted, these behaviors formed a coherent pattern and demonstrated clear demographic structuring, particularly among young adults. This findings indicate that traditional medicinal dietary practices remain actively integrated into modern health-conscious lifestyles.

While strong mechanistic evidence supports microbiota-mediated immune and metabolic modulation by mushroom polysaccharides and plant saponins [1, 2, 6-8], there is no significant differences in self-reported gastrointestinal or immune symptoms. This distinction likely reflects the difference between biological modulation and subjective symptom perception. Many microbiota-mediated processes operate at molecular and inflammatory levels and may not translate into immediate or noticeable changes in everyday symptoms, particularly among generally healthy individuals.

Importantly, mushroom-oriented dietary behaviors may function primarily as long-term preventive or regulatory strategies rather than acute symptom-modifying interventions. The absence of pronounced symptom differences does not negate potential biological effects but highlights the challenge of translating laboratory findings into real-world, self-reported health experiences. Traditional medicinal foods are often valued not for dramatic short-term changes but for gradual regulatory balance, a concept consistent with both ethnomedical practice and microbiota-based models of host modulation.

5. Conclusion

Overall, this study provides population-level insight into how traditional medicinal food practices are adopted and perceived today. By linking behavioral patterns with contemporary health awareness, the findings contribute to integrating ethnobotanical knowledge, microbiome science, and public health research. Future investigations may further clarify how sustained dietary exposure interacts with.

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