Perceptions and knowledge of chewing gum's health and environmental impacts: A survey-based study

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Abstract -

Chewing gum is a popular product worldwide, yet the synthetic polymers used in most commercial gum bases are non-biodegradable and pose both environmental and health risks. Chewing gum can release hundreds of microplastics per gram, which accumulate in the ecosystem as well as inside the human body. Despite these risks, public understanding of gum's plastic composition and associated consequences remains limited, especially among young adults, who represent a significant consumer demographic.

This study investigates consumer habits, awareness, and attitudes toward chewing gum as well as its environmental and health impacts. An online survey targeting individuals aged 18-30 assessed chewing frequency, motivations, knowledge of synthetic ingredients, disposal practices, and opinions on warning labels or eco-friendly alternatives. The results highlight significant gaps in product knowledge, indicating that 56% of participants were unaware of gum's plastic content, and 66% favored clearer labeling or regulatory action on this matter. A multitude of respondents reported concern. Additionally, 75% supported warning labels regarding potential health risks on gum packaging.

The findings show the need for targeted public education, labeling, and policy initiatives to promote sustainable consumption and informed decision-making among consumers.

Keywords - Chewing Gum, Microplastics, Polyvinyl acetate, Consumer awareness, Health concerns

I. Introduction

Chewing gum is often considered a harmless habit: an easy fix for fresh breath, stress relief, or simply a burst of flavor. It has a long history, evolving from natural tree resins to highly processed modern products (1). Gum is one of the most widely consumed confectionery products, with a global market exceeding billions of dollars annually, reflecting its deep integration into everyday consumer habits (2). Yet, few consumers recognize that most commercial gum bases are made with synthetic polymers, especially plastics. Modern gum bases contain polyvinyl acetate, polyethylene, and styrene-butadiene—synthetic rubbers also used in car tires and plastic bottles. These materials are non-biodegradable (3). It is commonly thought that gum requires anywhere between five to one thousand years to degrade (4). This non-biodegradable nature means that improperly disposed gum contributes substantially to urban litter problems, often requiring costly removal from streets, sidewalks, and

public spaces (4-5). Furthermore, as gum fragments disintegrate, they release microplastics into our mouths (6). Additionally, when gum is chewed and later discarded, it can potentially release these microplastics into nature.

The proliferation of microplastics has become a major environmental and public health concern. Emerging research suggests that microplastics have been detected in soil, waterways, and even in the human body. From a health perspective, recent evidence indicates that chewing gum can act as a direct source of microplastic ingestion, with particles entering the gastrointestinal tract during mastication, raising concerns about long-term health effects such as disruption of the immune system and the blood-brain barrier (6, 7, 8).

Despite these risks, consumer awareness of gum's plastic content remains low. Gum is marketed as an everyday-use product, sold in supermarkets, pharmacies, and convenience stores worldwide, with little to no indication of its synthetic ingredients (9). Adolescents and young adults, in particular, represent a significant demographic of gum consumers (10). Their habits and perceptions may be shaped by not only taste and social norms, but also by a lack of transparency about product composition. Understanding the degree of awareness regarding its environmental and health impacts is essential for informing future public health campaigns and policy initiatives.

This study explores the motivations and knowledge gaps surrounding chewing gum. Findings will contribute to a broader consideration of consumer education. This study not only documents chewing habits and awareness levels but also probes support for interventions such as eco-friendly alternatives, mandatory labeling, and public health campaigns. By examining the disconnect between perception and reality, this research contributes to a growing body of literature highlighting the intersection of consumer behavior, health, and environmental sustainability.

II. Methods

***Design**:*

This study employed a cross-sectional survey design to investigate the habits, awareness, and attitudes of individuals who chew gum, focusing additionally on health and environmental implications. A survey method containing both multiple-choice and Likert scale questions was employed to efficiently collect data from a large population of approximately176, and allow for both quantitative analysis of trends and qualitative insight into participant perceptions. The survey was administered entirely online to maximize accessibility and participation.

***Participants**:*

The focus group of participants was ages 18 to 30, as this group represents a major demographic of chewing gum consumers. There were no other inclusion or exclusion criteria beyond age. Participation was entirely voluntary and anonymous, with no incentives offered, to reduce response bias.

***Procedure**:*

1. Survey Development
    a. Designed a structured online survey using Microsoft Forms
    b. Questions were divided into sections on Demographics, Chewing Gum Consumption Habits, Health Issues and Ingredient Awareness, Knowledge of Microplastics and Environmental Impacts, and Public Health and Policy
2. Recruitment of Participants
    a. Participants were recruited through university channels

3. Informed Consent
    a. Prior to starting the survey, participants viewed and agreed to an informed consent form describing the purpose and procedures of the study, voluntary participation, anonymity, and any risks and benefits
4. Survey Administration
    a. Participants completed the survey independently
5. Data Management
    a. Completed responses were downloaded from the survey platform
    b. Responses were reviewed for completeness
6. Post-Survey Procedures:
    a. Data were anonymized and prepared for analysis, with identifiers removed to maintain participant confidentiality

III. Results and Findings

Demographics*:* Nearly all participants were between the ages of 18 and 30, with the majority reporting at least some college-level education. This demographic concentration reflects both the recruitment strategy and the natural prevalence of gum consumption within this age group, which aligns with global marketing data identifying young adults as the primary consumers of chewing gum.

Chewing Gum Habits*:* 73% of participants reported chewing gum regularly, underscoring the pervasiveness of the habit. Duration of chewing gum varied substantially, ranging from less than five minutes to more than half an hour, suggesting diverse motivations and contexts of use. The primary motivation for chewing gum was freshening breath, followed by taste/flavor, then stress relief, focusing/concentrating, oral health, and habitual chewing. This ranking indicates that sensory and social drivers outweigh health-framed motivations.

Product-Type and Ingredient Preferences*:* Two-thirds (67%) of participants reported consuming sugar-sweetened gum. This finding highlights a potential disconnect between health awareness and actual product choices, further complicated by limited ingredient label engagement. 42% reported not checking ingredients, and 34% reported only doing so occasionally, suggesting that transparency alone may not suffice without broader consumer education. Concern levels for sugar content, artificial sweeteners, and artificial color/preservatives were varied.

Health Issues & Ingredient Awareness*:* A considerable share of gum users who answered the item reported health issues. More than half (56%) of participants believed that excessive chewing gum could affect mental wellness, citing stress and anxiety, and 68% felt that chewing gum influenced their mood or behavior. Additionally, 79% had at least a little knowledge about health concerns from ingesting microplastics, although the depth of knowledge may have varied.

Microplastic Knowledge and Environmental Concern*:* Almost half of the respondents were unaware that conventional gum bases contain synthetic polymers, and 40% did not recognize that chewing gum is considered a source of microplastic pollution. Nevertheless, 54% of respondents expressed concern about the environmental impact of disposed gum. Given the high usage of chewing gum, this level of concern may point to meaningful interventions that mitigate gum-related environmental and health issues and that awareness of these consequences may outpace recognition of product composition, offering a strategic entry point for educational campaigns.

***Policy Attitudes**:* In the questionnaire, participants were asked items on government regulation, warning labels, mandatory disclosure of plastic/synthetic disclosure, and the likelihood that labels would influence purchase. A strong majority (64%) supported some level of governmental regulation, while an astonishing 75% favored warning labels on packaging to disclose potential health risks. Notably, 66% believed manufacturers should explicitly state the synthetic content of their products, with over half indicating that such disclosure would influence their purchasing decisions. Participants also supported a spectrum of public health measures, including school-based education programs, warning labels, and even partial bans, highlighting openness to systemic interventions.

IV. Interpretation and Takeaways

1. Regular chewing gum is common, yet product-specific knowledge lags
2. Ingredient vigilance is low, which aligns with the observed dominance of sensory motivation and may help explain why such confectionery items remain prevalent.
3. Environmental concern and health concern are actionable

V. Discussion

These findings suggest a significant gap in consumer knowledge regarding the synthetic nature of chewing gum and its environmental consequences.

***Future Direction**:* Future research should build on these findings by assuring that increased awareness through warning labels, ingredient disclosure, or targeting public campaigns can meaningfully shift consumer behavior. Behavioral change theories can provide useful frameworks for understanding this challenge. For example, the Health Belief Model suggests that individuals must perceive susceptibility and severity of risk before modifying habits, while the Theory of Planned Behavior emphasizes the roles of attitudes, perceived social norms, and self-efficacy in shaping decisions (11-12). Integrating these frameworks could clarify why awareness of gum's plastic content may not immediately lead to reduced consumption or support for alternatives. Future studies may consider longitudinal designs to track if increased awareness actually leads to sustained behavioral change. Additionally, expanding the scope beyond young adults to include adolescents, who are forming these long-term habits, and older adults, who may have different health concerns, could provide a more complete picture of gum consumption. Cross-cultural studies could also reveal how local norms and marketing strategies influence awareness and behavior.

***Limitations**:* This study was skewed towards university-affiliated students, which may not accurately represent the broader population. Additionally, we cannot confirm that awareness directly causes changes in behavior. Finally, the reliance on self-reported behavior introduces recall and may cause social desirability biases.

***Public Policy**:* The results of this study underscore the need for stronger regulatory frameworks around chewing gum, particularly given the widespread lack of awareness about the health and environmental issues caused by them. Singapore, for instance, has maintained a national ban on the sale of chewing gum since 1992 to address litter and maintenance costs. Policy responses can take multiple forms, ranging from warning labels to public campaigns (13). Other options could include mandatory ingredient disclosure, warning labels, or taxes on non-biodegradable gum products, paired with incentives for eco-friendly alternatives. Public awareness campaigns modeled after sugary drink interventions (Rethink Your Drink) may also prove effective in shifting norms, particularly framed around health protection (14).

VI. Conclusion

This study highlights an often overlooked contributor to the microplastic crisis: chewing gum. With many regular users, gum is embedded in daily life, yet awareness of its synthetic composition and environmental consequences remain limited. Nearly half of the participants were unaware that gum bases contain plastics such as polyvinyl acetate, and 40% did not recognize gum as a microplastic source. A staggering 68% reported feeling that chewing gum affects their mood or behavior. At the same time, over half expressed concern about the environmental impact of discarded gum and indicated openness to biodegradable alternatives if made accessible. Additionally, chewing gum poses many health risks due to the microplastic content. These findings reveal a critical gap between knowledge, attitudes, and behavior. Addressing this issue will require collaborative strategies that combine education, transparent labeling, and the promotion of sustainable alternatives. Policymakers must take proactive steps to address the growing health and environmental risks associated with chewing gum. In doing so, chewing gum can serve as a case study in how small, everyday products contribute to global challenges, and how informed policy and innovation can bridge the divide.

VII. Figures

Fig 1. Survey question regarding how many respondents feel that chewing gum affects their mood and/or behavior

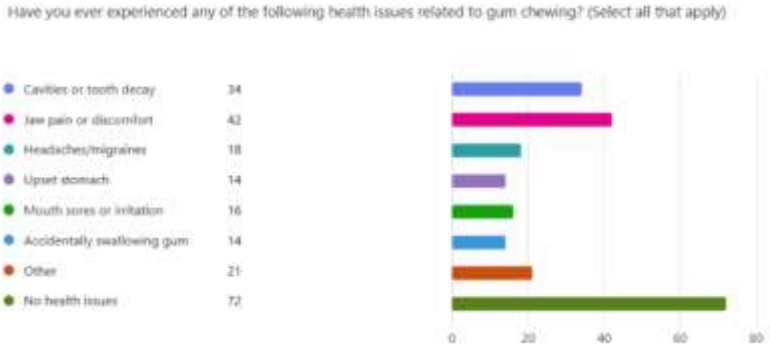

Fig 2. Survey question regarding how many respondents feel that chewing gum affects their health

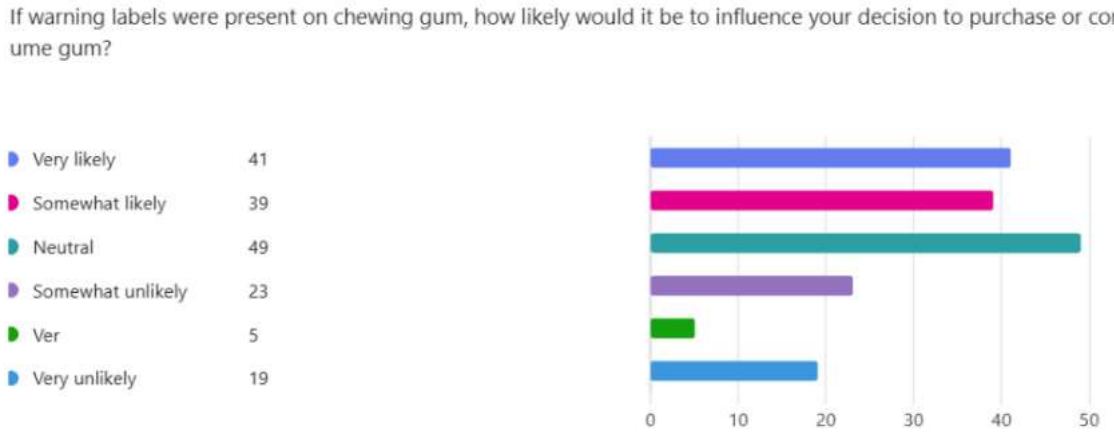

Fig 3. Survey question regarding whether warning levels would influence the purchase of chewing gum

Fig 4. Survey question regarding concern of improperly disposed chewing gum

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Resources

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