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Caffeine Consumption Patterns and Public Awareness and Attitudes: A Cross Sectional Survey

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Abstract. Caffeine is among the most consumed psychoactive substances worldwide, with well-documented benefits –such as reduced risk of cardiovascular diseases and neurodegenerative diseases --and risks, including sleep disturbances and other side effects. It has become integral to daily life, and consumption patterns vary across population groups and over time. This study investigated caffeine consumption pattern in coastal China through a comprehensive online questionnaire. The survey assessed demographics, consumption behaviors, knowledge, attitudes, and perceived effects. A total of 481 valid responses were collected from individuals aged 12 years and older without restrictions on gender, education, or occupation. Data were analyzed using chi-square tests, independent-sample t-tests, ANOVA, kruskal–wallis tests and regression models, as appropriate. Findings revealed that caffeine consumption was widespread and significantly associated with younger age groups and metropolitan residence. Student reported relatively higher energy drink use, which non-students consumed more coffee and tea. Importantly, higher knowledge and concern about caffeine were linked to regular use, indicating that awareness may reflect lived experience and self-regulation rather than acting as a deterrent. This study highlights the complexity of caffeine-related behaviors and underscore the need for targeted health strategies that address the specific motivations and contexts of different consumer groups. This study contributes valuable evidence for scholars, public health education, and local policy initiatives in Chinese context.

Keywords: coffee consumption, public health, cross sectional survey, health belief model

1. Introduction

Caffeine, a central nervous system stimulant, is one of the most consumed psychoactive substances worldwide. Naturally present in coffee beans, tea leaves, cocoa, and kola nuts, it is ingested through coffee, tea, energy drinks, cola, and other beverages across diverse age groups, both for enjoyment and as a performance enhancer.

Moderate intake has been linked to several health benefits, including reduced risk of cardiovascular diseases [1], neurodegenerative diseases, obesity, diabetes, and certain cancers [2]. For most healthy adults, daily consumption below 400 mg is generally considered safe [3]. However, Long term or excessive use can lead to sleep disturbances, migraine, or increased

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intraocular pressure [4], with adolescents, children, and pregnant women being more vulnerable to adverse effects [3].

Patterns of caffeine use vary across demographics and contexts. Studies show differences by age and gender, with higher consumption reported among adult males and middle-aged individuals [5], and among students, energy drinks are often consumed for alertness [6,7]. Cultural and regional differences further shape consumption patterns [5]. While the Health Belief Model suggests that knowledge and perceived risks should discourage risky use, critiques highlight a more complex relationship in which knowledge may emerge from personal experience and support continued consumption [8] .

Given caffeine's global popularity and the 37% increase in consumption over the last two decades [9], even small risk can have significant public health implications. Yet most dietary guidelines emphasize potential harms over benefits [10], and little is known about how knowledge, attitude, and context interact to shape consumption in specific populations.

This study addressed that gap by analyzing caffeine consumption patterns from multiple perspectives including behavior, cognition and environment through a comprehensive questionnaire distributed among the coastal areas of China. It aims to provide reference for the provision of health education, implementation of health policies, and the understanding of consumer behaviors.

2. Methods

2.1. Study design and participants

A cross-sectional online survey was conducted among 481 participants aged 12 years and older, with no restrictions on gender, education, or occupation to ensure sample diversity.

2.2. Survey instrument

The questionnaire assessed demographics (gender, age, education, employment, residence), caffeine consumption (regular use, beverage type and frequency, daily volume, timing, sources, and locations), and knowledge and attitudes (identification of caffeinated drinks, awareness of safe limits, perceived benefits and risks, and side effects). Control behaviors, such as reducing or stopping intake in specific situations, were also captured, including pregnancy-related considerations for women of reproductive age.

2.3. Data processing

Survey data were processed in Python. Binary and multi-select responses were recoded into indicator variables, and Likert-scale items were coded 1–5, with higher scores reflecting stronger knowledge, attitudes, or perceived effects. Composite indices for knowledge and positive attitudes were calculated as mean scores across relevant items. Daily consumption volumes were estimated by standardizing beverage intake into cup-equivalents and summing across types.

2.4. Statistical analyses

Analyses were performed in Python using scipy and statsmodels. Chi-square tests assessed categorical associations, t-tests and ANOVA examined group differences, and logistic or linear regressions identified predictors of regular consumption, attitudes, and control behaviors. Statistical significance was set at $p < 0.05$, with non-parametric tests applied where assumptions were violated.

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3. Result

3.1. Overall consumption and sociodemographic associations

Among 481 respondents, 60.7% reported regular caffeine consumption, while 39.3% did not, Indicating caffeine use as a majority but not universal behavior (Fig.1a). The demographic profile of participants, along with prevalence of consumption across subgroups, is summarized in Table 1.

Core sociodemographic findings were obtained from bivariate associations. While sex doesn't appear to have association with caffeine consumption (χ^2=0.86, p=0.65), and education level (χ^2=6.21, p=0.10), significant association emerged between age group and caffeine consumption (χ^2=13.27, p=0.039). Younger and mid-adults (18–40) reported higher consumption rates, while adults aged 50 and above were less likely to consume caffeine regularly (Fig.1b). Multivariable analysis showed consistent results: compared to 18–25-year-olds, adults aged 51–60 (β=–0.75, p=0.13) and 60+ (β=–1.74, p=0.18) had lower odds of caffeine use. In addition, living environment was marginally associated with consumption (χ^2=9.00, p=0.061). Respondents in metropolitan centers and suburbs consumed caffeine more often than those in small or medium-sized cities or rural areas (Fig.1c).

Employment context also shaped consumption. While overall rates did not differ significantly between student and non-students (χ^2=1.29, p=0.26), beverage-specific patterns diverged. Non-students were more likely to consume coffee and tea on a daily basis, with 49 reporting multiple coffees per day compared to only 1 student. In contrast, students demonstrated a higher relative reliance on energy drinks, with 24% reporting weekly or more frequent use compared to 20% of non-students (Fig.1d).

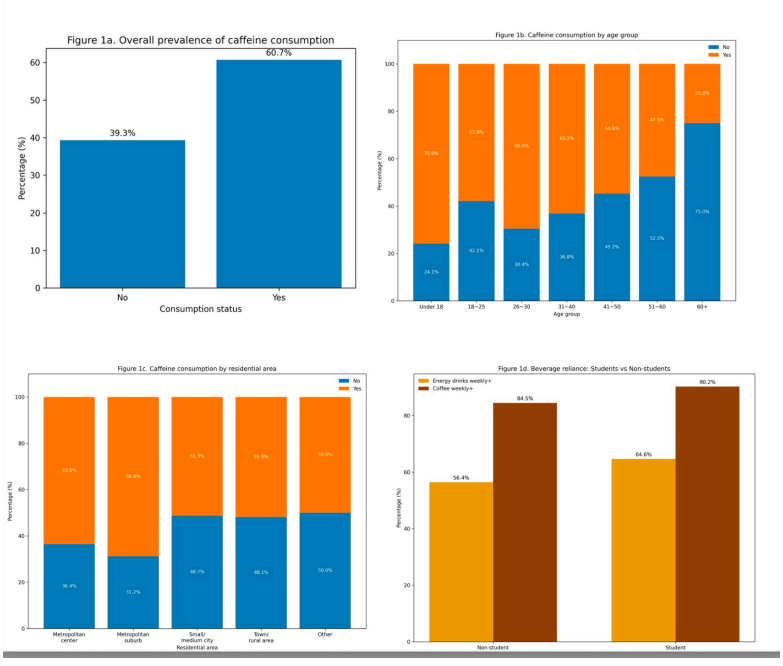

Figure 1. Overall consumption and sociodemographic associations

(a) Prevalence of caffeine consumption among respondents (N = 481). (b) Consumption by age group, showing higher prevalence in younger and mid-adults. (c) Consumption by residential area, with metropolitan and suburban residents reporting higher use than smaller-city or rural respondents.

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(d) Beverage-specific reliance: students reported more frequent energy drink use, while non-students consumed coffee more often.

Table 1. Sociodemographic characteristics of survey participants and prevalence of caffeine consumption (N = 481)

Variable Tested	$X^2(df)$	p-value	Association with Caffeine Use
Sex (Male vs. Female)	0.86 (1)	0.65	Not significant
Education level	6.21 (3)	0.10	Not significant
Age group	13.27 (4)	0.039	Significant: younger adults higher consumption
Living environment	9.00 (3)	0.061	Not significant
Student vs. Nonstudent	1.29 (1)	0.26	Not significant

Table presents sample distribution by gender, age group, education level, employment status, and residential area, along with the proportion of respondents reporting regular caffeine consumption within each subgroup. Percentages are shown relative to category totals.

3.2. Association of time, place and source of consumption and overall consumption pattern

Timing of caffeine use influenced risk perception. Afternoon consumers expressed the greatest concern about sleep disturbance (M=3.24, SD=1.24), followed by morning consumers (M=3.00, SD=1.14), and evening consumers (M=2.71, SD=1.26) (Fig.2a). However, actual prevalence of self-reported sleep problems did not differ significantly across groups (42.0%, 41.1%, 32.9% respectively; χ^2=2.00, p=0.368) (Fig.2b). Therefore, while later caffeine consumption was associated with lower perceived concern about sleep disturbance, it was not significantly related to the actual prevalence of reported sleep problems. This indicates a discrepancy between individuals' risk perception and their reported experience of sleep outcomes.

Location of consumption is strongly associated with consumption patterns. Coffee and tea were most prevalent in workplace and school settings, where odds of daily consumption were nearly three times higher than among individuals primarily drinking at home or elsewhere (Fig.2c), likely reflecting the demands of these settings for alertness and productivity.

Source of drinks further influence intake: average daily coffee intake differed significantly by source (ANOVA F=9.72, p<0.001), with store and delivery consumers reporting substantially higher use compared to those preparing coffee at home (Fig.2d).

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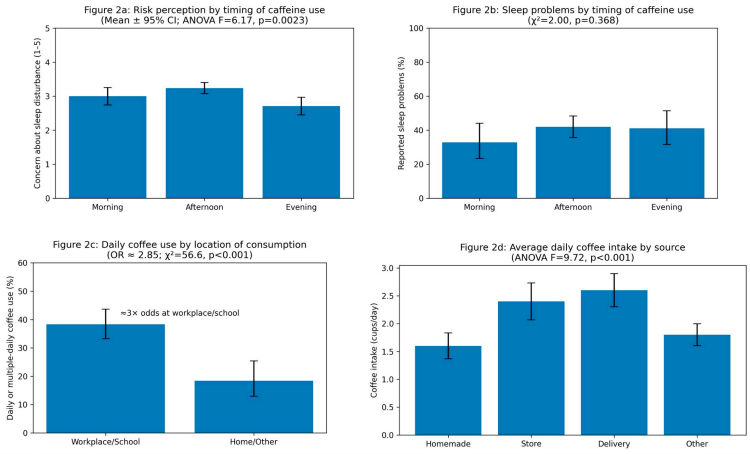

Figure 2. Associations of timing, location, and source with caffeine consumption

(a) Concern about sleep disturbance differed by timing of use, highest in afternoon consumers (ANOVA F=6.17, p=0.0023). (b) Prevalence of self-reported sleep problems did not differ significantly across timing groups (χ^2=2.00, p=0.368). (c) Workplace/school consumers had nearly threefold higher odds of daily intake than home/other settings (χ^2=56.6, p<0.001; OR≈2.85). (d) Average daily coffee intake was greater for store- and delivery-based sources compared to homemade (ANOVA F=9.72, p<0.001).

3.3. Knowledge and attitudes on caffeine consumption

Respondents reported moderate concern about caffeine's side effects (mean concern score ≈3 on a 1–5 scale). Surprisingly, regular consumers expressed higher concern than non-consumers (t=2.39, p=0.018) (Fig.3a). Logistic regression adjusting for demographics confirmed concern score as a positive positive predictor of caffeine use (β=0.21, p=0.032; OR≈1.23), suggesting concern may stem from personal experience with regular use rather than functioning as a deterrent.

Overall, participants demonstrated moderate-to-high levels of knowledge (M = 3.28, SD = 0.65) and positive attitudes (M = 3.56, SD = 0.74) on a 1–5 scale. This score is obtained from matrix question testing knowledge. Independent-sample t-tests revealed that regular caffeine consumers scored significantly higher on both knowledge(M ≈ 3.34 vs. 3.09; t = 2.47, p = 0.0138) and attitudes (M ≈ 3.62 vs. 3.40; t = 2.47, p = 0.0138) than non-consumers (Fig.3b). However, in multivariable models controlling for demographics, neither knowledge(β = 0.239, p = 0.136) nor attitude (β = 0.246, p = 0.081) remained significant. This suggests that attitudes contribute to, but do not solely determine, patterns of caffeine consumption.

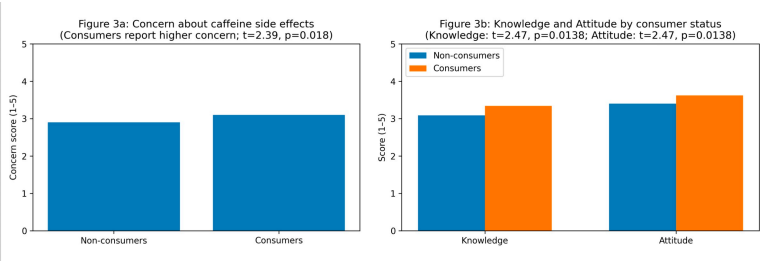

Figure 3. Knowledge, attitudes, and concern by caffeine consumption status

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(a) Consumers reported significantly higher concern about caffeine side effects compared to non-consumers (mean ≈3.1 vs. 2.9; t=2.39, p=0.018).(b) Consumers scored higher on both knowledge (3.34 vs. 3.09; t=2.47, p=0.0138) and attitudes (3.62 vs. 3.40; t=2.47, p=0.0138).

4. Discussion

This study reveals that caffeine consumption behaviors in the population are predominantly affected by age, lifestyle context and personal experience, rather than basic demographic factors. Our findings also highlight differences in consumption pattern between students and non-students, and uncover the relationship between knowledge of caffeine, concerns about its consumption, and actual behavior. Together, these results provide a more nuanced understanding of the drivers behind caffeine use in the general population.

Younger and mid-adults were reported to have higher odds of regular caffeine consumption, which is largely consistent with other studies. Results from Fulgoni III and colleagues in the US from 2001 to 2010 (2015) showed that adults aged 30 to 70 consumes the most caffeine, which is older than the results from this study. This suggests either a trend toward earlier caffeine adoption or cultural differences. The high consumption in younger and mid-adults may be attributable to their participation in school and workplace, which in this study were the most common locations of caffeine use. Sex was also reported as an influencer of caffeine consumption in the U.S [5]., with men consuming more than women. However, in this study, the association with sex was insignificant, suggesting either a change of pattern over time or cultural divergence.

Students were found to consume more energy drinks than any other age groups. This may be explained by their need for alertness, a strong motivation for caffeine consumption among young populations [6]. Although energy drink consumption in this population was lower compared with adolescents studied in other countries [11,12], possibly due to cultural and market differences, understanding reasons behind the pattern may still facilitate targeted health education and interventions.

Evening caffeine consumers are least worried about sleep problems, but there is no significant difference in actual sleep problems between morning, afternoon and evening consumers. In fact, morning and afternoon consumers reported more sleep problems than evening consumers. This reveals the complex relationship between perceived and actual risk, which may be influenced by individual tolerance level, amount of consumption, or other confounding lifestyle factors.

Regular consumers of caffeine expressed higher knowledge level and greater concern about their behavior. This finding directly challenges the conventional assumption of the Health Belief Model [8], which suggests that greater knowledge and perceived threats typically act as deterrents. Instead, our observations align with critiques within health literature, which emphasize that the relationship between knowledge, risk perception, and behavior is more complex than linear [8]. For regular consumers, higher knowledge and concern may not originate from health warnings but rather from personal experimentation with dosage, timing, and source to optimize alertness and minimize discomforting symptoms. In this context, knowledge functions less as a barrier to consumption and more as a form of practical empowerment that supports continued use.

In conclusion, caffeine consumption is revealed to be a complex result of lifestyle, experience and perception. Therefore, future public health efforts should not only focus on generic knowledge dissemination but also design tailored strategies that address specific motivations and context of different consumer groups, particularly young adults and students.

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5. Conclusion

This study demonstrates that caffeine consumption in coastal China is widespread and shaped primarily by age, lifestyle context, and personal experience. Interestingly, regular consumers exhibited higher knowledge of caffeine as well as greater concern about its consumption, suggesting that awareness of health risks may reflect consumer's experiences with the behavior rather than deterring them from it. Several limitations should be considered, including the cross-sectional design, which cannot establish causal inference, and the reliance of self-reported data, which may be subjective or biased. Additionally, the sample was restricted to coastal settlements in China, with most respondents living in metropolitans and suburb areas, limiting the study's applicability to smaller settlements and inland populations. Future research could employ longitudinal designs to explore causal relationships and include more diverse geographic and socioeconomic groups to better understand differences. Such efforts would support the development of tailored public health strategies suited for specific consumer groups.

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