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Patterns of Alcohol Use and Their Association with Religiosity and Family Support Among University Students in Khuzestan Province, Iran: A Cross-Sectional Latent Class Analysis

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Abstract

Background: Alcohol consumption among Iranian university students is rising despite religious and legal prohibitions. This study used latent class analysis to identify alcohol consumption patterns among Iranian university students. It examined associations of religiosity and family support with class membership.

Methods: A cross-sectional study surveyed 513 university students in Khuzestan Province, Iran. Validated self-administered questionnaires were used to assess alcohol consumption behaviors, religiosity, and family support. Latent class analysis was performed to identify distinct subgroups of drinking behavior and to evaluate associations with demographic and psychosocial variables.

Results: Lifetime alcohol use was 12.9% among students, with past-year and past-month prevalence of 8.2% and 6.6%, respectively. Latent class analysis identified four groups: non-drinkers (87.9%), at-risk drinkers (3.0%), high-risk drinkers (3.1%), and very high-risk drinkers (5.9%). Higher religiosity scores were independently associated with lower odds of membership in the at-risk and very high-risk drinking classes. Family support was not independently associated with latent class membership after adjustment for potential confounders. Male students had higher odds of membership in higher-risk drinking classes compared with female students.

Conclusion: Four alcohol consumption patterns were identified among Iranian university students. Higher religiosity was independently associated with lower odds of at-risk and very high-risk drinking class membership, while male sex was associated with higher odds of at-risk and high-risk class membership. Family support showed no independent association with class membership. These findings suggest that religiosity may inform culturally appropriate prevention strategies, while longitudinal research is needed to clarify the role of family support.

Keywords: Alcohol consumption, religiosity, family support, students

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Introduction

Alcohol consumption, with varying patterns and levels among populations, is a significant public health concern worldwide due to its potential to cause physical and social health problems (1). Alcohol-related injuries are estimated to account for approximately 5.9% of deaths and 5.1% of disability-adjusted life years (DALYs) worldwide each

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Key Messages:

↑What is "already known" in this topic:

Alcohol use among university students is heterogeneous, but evidence on latent drinking patterns and their social correlates in Middle Eastern populations remains limited.

→What this article adds:

This study identified four distinct alcohol consumption patterns among Iranian university students. Higher religiosity was independently associated with lower odds of higher-risk drinking class membership, whereas male sex showed higher odds; family support was not independently associated after adjustment.

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year (2). Although the production and consumption of alcohol are illegal in Iran, the presence of homemade and smuggled foreign alcoholic beverages has facilitated access. However, despite the lower alcohol consumption prevalence in Islamic countries such as Iran because of Sharia and legal restrictions, this prevalence is increasing because of changing cultural norms and accessibility (3).

When starting university life, students separate from their families and encounter new experiences and challenges, prompting changes in their lifestyles that increase the likelihood of engaging in high-risk behaviors (4). According to a meta-analysis, approximately one in eight individuals in Iran reports alcohol consumption, while the prevalence of current and lifetime alcohol use among Iranian school and university students has been estimated at 11.7% and 14.5%, respectively (3). Alcohol consumption can lead to adverse consequences such as poor academic performance, injuries, and risky sexual behaviors (5-7). Given the serious consequences of alcohol consumption during youth and adolescence for individuals' future, conducting studies to understand the factors influencing consumption habits is essential (8, 9).

Factors such as religious beliefs, family support, susceptibility to peer pressure, symptoms of depression, low self-esteem, lifestyle choices, and high levels of stress and anxiety all influence individuals' tendency to consume alcohol (10, 11). Among these factors, religious beliefs and family support are two crucial influences on people's drinking habits (11).

Religiosity, reflecting a person's faith, involvement in religious practices, and connection to a faith community, serves as an important buffer against engaging in risk-taking behaviors(12). Various studies have highlighted religion as a significant inhibitory factor for alcohol consumption, with a positive correlation between religiosity and reduced alcohol consumption (13, 14). In Iran, religiosity is deeply embedded in the nation's culture and society, where most people identify as Muslim—predominantly Shiite—and religious values strongly influence daily life, social customs, and national identity (15). Nevertheless, the effect of religiosity may differ according to personal interpretation, cultural background, and individual experience (16).

In Iranian health-related research, religiosity is assessed using both indigenous measurement tools and instruments adapted from international settings, highlighting its multidimensional nature and relevance to spirituality and psychological well-being within the Iranian cultural context. These tools assess a range of religious beliefs, practices, and psychological dimensions rooted in Islamic teachings (17). The comprehensive assessment of religiosity, including religious orientation and practice, enables researchers to better understand its impact on health outcomes in Iran's unique socio-cultural setting (18).

Similarly, research consistently demonstrates that family relationships—including the quality of parental support, communication, and the establishment of clear behavioural norms—are central to preventing and delaying alcohol initiation in adolescents (8, 19, 20). Parental warmth and monitoring help foster self-control and reduce vulnerability to peer influence, whereas dysfunctional family environments, characterized by conflict, poor communication, unrealistic expectations, and parental substance use, are associated with higher rates of alcohol consumption among youth (20, 21). However, not all adolescents from less supportive families go on to engage in risky drinking, as resilience, positive peer connections, and broader community factors also play pivotal protective roles (19, 22). Accordingly, prevention efforts that strengthen family functioning, encourage open dialogue, and promote supportive parenting practices are crucial in reducing youth alcohol use (23).

Latent class analysis (LCA) is a model-based statistical technique used to uncover distinct, unobserved subgroups within a population based on similarities in individuals' response patterns across a set of observed indicators (24). The present study seeks to contribute to the existing literature by investigating patterns of alcohol use among university students in Khuzestan Province, Iran, with a particular focus on their associations with religiosity and perceived family support. Specifically, it aims to (1) identify distinct subgroups of students based on their alcohol consumption patterns using latent class analysis (LCA), and (2) examine the associations of religiosity and family support with latent class membership. Based on previous literature, higher levels of religiosity and stronger family support have been associated with lower levels of alcohol use and other alcohol-related risk behaviors among young adults. The findings may inform culturally appropriate interventions, public health strategies, and university policies aimed at reducing alcohol-related harm and promoting student well-being.

Methods

Study population

A cross-sectional study was carried out among university students in Khuzestan Province, Iran, from mid-2023 to mid-2024. The study design and reporting followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional research. Participants were recruited using a non-probability convenience sampling approach from a university in Khuzestan Province, Iran, with efforts made to include students from different academic disciplines and study levels. The focus on university students reflects the recognition that young adulthood is a developmental stage characterized by growing independence, lifestyle changes, and exposure to behaviors that may carry certain risks. Numerous studies in diverse social and cultural contexts have highlighted the importance of this age group in understanding behavioral and health-related risk tendencies. The year-long data collection period facilitated comprehensive participation and high data quality. The response rate of 85% was considered satisfactory and helped to reduce concerns about potential non-response bias.

Consent to participate

The research was conducted in compliance with the ethical principles outlined in the Declaration of Helsinki and the regulations established by the Iranian Ministry of

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Health and Medical Education. Participation was voluntary, and written informed consent was obtained from all participants prior to data collection. To ensure anonymity and protect confidentiality, no information that could directly identify individual participants was collected during the questionnaire administration.

Sample size calculation

The required sample size was estimated based on the requirements of latent class analysis (LCA), which generally requires an adequate number of participants to ensure stable class identification and reliable estimation of model parameters. Based on methodological recommendations, a minimum sample of approximately 500 participants was targeted to achieve reliable class identification and adequate model precision (12, 25). The final analytical sample included 513 university students, which met the required sample size for LCA.

Study tools

Data collection was conducted through a validated self-administered questionnaire, which participants completed individually without assistance. The questionnaire had previously demonstrated acceptable validity and reliability in studies conducted among Iranian university students and consisted of standardized items assessing alcohol consumption behaviors and related psychosocial characteristics. Prior to enrollment, participants were informed about the study objectives and the confidentiality of their responses, and written informed consent was obtained from all participants. Written informed consent was obtained from all participants, whose involvement in the study was entirely voluntary. The research protocol received approval from the university's ethics committee, and the study was conducted in accordance with established ethical guidelines and principles. To gather information on students' demographics and on the use of various substances, such as alcohol and cigarettes, by themselves and by their acquaintances, a standardized questionnaire, whose validity and reliability have been assessed in several studies (26, 27), was used.

This questionnaire, which is the primary focus of the current study, assesses alcohol consumption over different time periods (lifetime, past year, past month) among students, their family members, and friends. In this questionnaire, questions related to alcohol consumption were asked as follows: "Do you have any experience consuming alcoholic beverages (such as beer, wine, and other types of alcohol) at least once in your lifetime? How old were you when you first consumed an alcoholic beverage? Have you ever consumed a full glass of alcohol (meaning 330 millilitres or two glasses of beer, 200 millilitres or one glass of wine, 40 millilitres or one shot of other types of alcohol, without counting other mixed drinks)? How old were you when you first consumed a full glass of alcohol? Have you consumed a full glass of alcohol in the past year? Have you consumed five full glasses of alcohol (or other types of alcohol) consecutively in the past year? How often did you consume five full glasses of alcohol (or other types of alcohol) consecutively in the past year? How often did you consume alcoholic beverages (such as beer, wine, and other types of alcohol) in the past month? Is there someone in your family who has consumed alcohol in the past month? Is there someone among your close friends who has consumed alcohol in the past month?".

Perceived parental support was measured using the Persian adaptation of the 13-item instrument originally developed by Aneshensel and Sucoff (28). Representative items were: (a) "My mother and/or father show(s) me that I can trust them/him/her" and (b) "My mother and/or father really understand(s) me." Each item was rated on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), with a midpoint of 3 indicating a neutral response. The negatively phrased item, "My mother and/or father do(es) not pay enough attention to me," was reverse-scored before calculating the total score. Possible scores ranged from 13 to 65, with higher values reflecting greater perceived parental support. Evidence supporting the validity and reliability of the Persian version has been reported in previous research (29). In the current study, the instrument exhibited excellent internal consistency (Cronbach's $\alpha = 0.93$).

Religiosity was evaluated using the Persian version of the 28-item General Religiosity Scale, originally developed by Kendler et al. (30) and subsequently translated and validated by Farhadinasab et al. (29). Examples of questionnaire items include: (a) "I ask God to help me make important decisions," (b) "I feel God's love for me, directly or through others," and (c) "Every day I see evidence that God is active in the world." Participants rated each statement on a five-point Likert scale, from 1 (completely disagree) to 5 (completely agree). The overall score could range from 28 to 140, with higher scores representing greater religiosity. Previous studies have reported satisfactory validity and reliability for the Persian adaptation of this instrument (29). In the present sample, the instrument demonstrated excellent internal consistency, with a Cronbach's alpha coefficient of 0.97.

In the present study, both questionnaires demonstrated satisfactory internal consistency, and Cronbach's alpha coefficients were calculated using the study sample to evaluate their reliability.

Statistical analysis

Family support and religiosity scores were compared between groups defined by binary variables using independent-samples t-tests. Statistical significance was determined at a threshold of $\alpha = 0.05$. Considering the relatively large sample size, the use of t-tests was deemed appropriate, given their robustness to moderate departures from the assumption of normality in sufficiently large samples. Latent class analysis (LCA) was then conducted using indicators of alcohol use patterns to identify distinct student subgroups. Model fit was assessed with likelihood-ratio chi-square, AIC, BIC, and entropy, selecting the best model based on lower fit statistics and higher entropy. Selection of the optimal latent class model was based on multiple complementary criteria rather than a single statistical index, including AIC, BIC, entropy, class separation, and substantive interpretability of the identified classes. Because the analyses were conducted using SAS version 9.2, Bootstrap

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Likelihood Ratio Tests (BLRT) and Lo–Mendell–Rubin adjusted likelihood ratio tests (LMR-LRT) were not available. Entropy was used as the primary measure of classification quality because additional classification indices, including average posterior probabilities and classification error rates, were not available in the standard output generated by the software used in this study. Covariates, including age, sex, marital status, family support, and religiosity, were incorporated into a latent class regression model to examine their associations with latent class membership. Multinomial logistic regression was employed within the latent class analysis (LCA) framework to examine the relationships between covariates and latent class membership. The associations were expressed as odds ratios (ORs) accompanied by their corresponding 95% confidence intervals (CIs).

For descriptive interpretation of the latent classes, conditional item-response probabilities greater than 0.50 were considered indicative of characteristics that were more likely than not to be present within a given class. This threshold was used solely to facilitate interpretation of the latent class profiles and was not used for model estimation or class assignment, which were based on maximum likelihood estimation and overall model fit indices. Analyses were performed using SAS 9.2.

Results

In this study, 513 students participated with a mean age of 23.02 ± 2.90 years; 37% were male. Descriptive analysis showed that 12.9% of students reported lifetime alcohol consumption, with 8.2% and 6.6% reporting use in the past year and past month, respectively. Alcohol use was reported among 8.2% of family members and 16% of close friends.

A summary of alcohol drinking behaviors in relation to familial support and religious beliefs is presented in Table 1. The descriptive analysis revealed that students who reported alcohol consumption during their lifetime, who had consumed one glass or five glasses of alcohol in the past year, or who reported recent alcohol use had lower family support scores compared with those who did not engage in these behaviors. These differences were statistically significant for most behaviors, except alcohol drinking during the past month and alcohol consumption among family members.

Similarly, regarding religious belief scores, the analysis showed that students who consumed alcohol or had close friends or family members who drank generally had lower religious belief scores. These differences were statistically significant for most drinking-related behaviors, including lifetime drinking, recent consumption, and alcohol use among friends and family members. Additionally, religious belief scores differed significantly according to alcohol drinking by family members during the past month.

Latent class analysis using seven indicators initially identified models ranging from one to seven classes. No single model fit criterion uniformly favored the four-class solution. The two-class model had the lowest BIC (191.64) and slightly higher entropy (0.99) than the four-class model (BIC = 228.41; entropy = 0.98). However, the four-class model had the lowest AIC (96.96) and provided greater differentiation and substantive interpretability of alcohol consumption patterns than the more parsimonious two-class solution. Entropy remained high in the four-class model, indicating excellent classification quality, although it was not higher than that of the two-class model. Considering the complementary information provided by AIC, BIC, entropy, class separation, and substantive interpretability, the four-class solution was retained as the most meaningful representation of the heterogeneity in drinking behaviors (Table 2). Because BLRT and LMR-LRT were not available in SAS version 9.2, the selection of the four-class solution was based on these complementary criteria rather than a formal likelihood-ratio test.

Table 1. Characteristics of drinking behaviours by familial support and religious beliefs

Measure	Score of familial support	*P* value	Score of religious beliefs	*P* value	n (%)
	Mean ± SD		Mean ± SD		
Alcohol drinking during the lifetime					
No	51.07±10.84	0.019	110.27±22.46	<0.001	447 (87.1)
Yes	48.27±8.69		99.00±23.99		66 (12.9)
One glass alcohol drinking during the lifetime					
No	51.05±10.83	0.003	109.87±22.48	0.002	465 (90.6)
Yes	47.29±7.63		99.00±25.18		48 (9.4)
One glass alcohol drinking during the past year					
No	50.94±10.81	0.034	109.68±22.48	0.008	471 (91.8)
Yes	48.09±7.83		99.60±26.15		42 (8.2)
Five glasses alcohol drinking during the past year					
No	50.92±10.74	0.013	109.65±22.44	0.001	485 (94.5)
Yes	47.00±7.50		94.61±27.29		28 (5.5)
Alcohol drinking during the past month					
No	50.77±10.65	0.618	109.39±22.63	0.048	479 (93.4)
Yes	49.82±10.31		101.12±26.16		34 (6.6)
Alcohol drinking among family members in the past month					
No	50.77±10.72	0.633	109.59±22.92	0.017	471 (91.8)
Yes	49.95±9.51		100.55±21.67		42 (8.2)
Alcohol drinking among close friends in the past month					
No	51.57±10.68	<0.001	111.09±21.90	<0.001	431 (84.0)
Yes	46.21±9.14		97.66±24.83		82 (16.0)

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Table 2. Comparison of Latent Class Analysis (LCA) Models Across Different Numbers of Classes Using Model Fit and Selection Criteria

Number of latent classes	Number of parameters estimated	G^2	df	AIC	BIC	Entropy	Maximum log-likelihood
1	7	887.66	120	901.66	931.35	1.00	-1106.17
2	15	98.04	112	128.04	191.64	0.99	-711.35
3	23	62.97	104	108.97	206.50	0.97	-693.82
*4	31	34.96	96	96.96	228.41	0.98	-679.82
5	39	26.95	88	104.95	270.32	0.94	-675.81
6	47	21.04	80	115.04	314.33	0.90	-672.85
7	55	18.54	72	128.54	361.76	0.78	-671.60

*The four-class model was selected as the optimal solution based on multiple model evaluation criteria, its interpretability, and the plausibility of the resulting class structure

Table 3. The four-class latent class model of alcohol consumption and related indicators

	Latent class			
	Non-drinkers	At risk of drinking	High-risk drinkers	Very high-risk drinkers
Latent class prevalence	0.879	0.030	0.031	0.059
Item-response probabilities				
Alcohol drinking during the lifetime	0.027	0.477	*0.986	*0.993
One glass alcohol drinking during the lifetime	0.000	0.113	*0.985	*0.993
One glass alcohol drinking during the past year	0.004	0.001	*0.614	*0.984
Five glasses alcohol drinking during the past year	0.000	0.000	*0.615	*0.591
Alcohol drinking during the past month	0.023	0.216	0.493	0.395
Alcohol drinking among family members in the past month	0.023	*0.968	0.001	*0.531
Alcohol drinking among close friends in the past month	0.091	*0.676	0.006	*0.987

Note. Values represent class-specific conditional item-response probabilities. Item-response probabilities greater than 0.50 are highlighted to facilitate interpretation, indicating that members of the corresponding latent class were more likely than not to endorse that indicator. The 0.50 threshold was used solely as a descriptive convention and not as a criterion for model estimation or latent class assignment.
*Item–response probabilities >.5 in bold to facilitate interpretation.

The latent classes were labelled according to the overall pattern of item-response probabilities across all alcohol-related indicators rather than any single indicator or predefined probability threshold. Specifically, the latent classes exhibited distinct patterns of personal alcohol consumption and social exposure to alcohol use, rather than progressively higher levels of alcohol-use severity. The at-risk class was characterized primarily by alcohol use among family members and close friends, whereas the high-risk class showed a higher probability of past-month alcohol use despite minimal reported alcohol use among family members and friends. These labels were intended to facilitate interpretation and do not represent clinically validated risk categories. The largest class comprised non-drinkers (87.9%), followed by the very high-risk (5.9%), high-risk (3.1%), and at-risk (3.0%) drinking classes (Table 3).

Figure 1 illustrates the conditional item-response probabilities across the four latent classes, providing a visual representation of the distinct alcohol consumption patterns identified by the latent class analysis. The high-risk and very high-risk classes exhibited consistently higher probabilities of lifetime, past-year, and past-month alcohol use than the non-drinker and at-risk classes. In addition, alcohol use among close friends and family members was more common in these higher-risk classes.

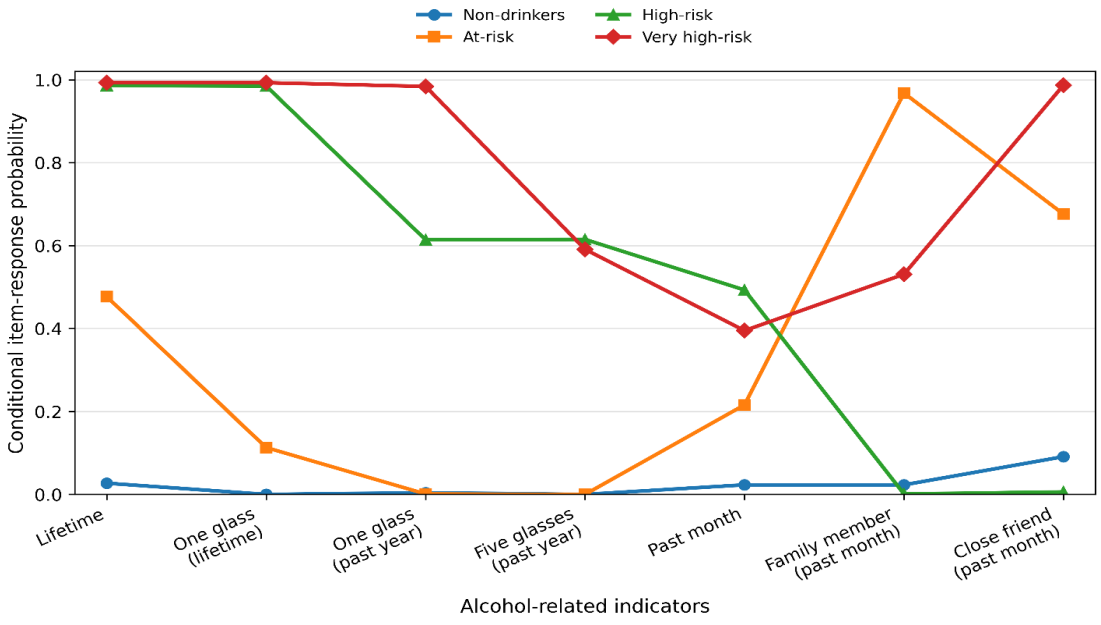

Figure 1. Class-Specific Conditional Response Probabilities for Alcohol-Related Indicators Across the Four Identified Latent Classes

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Table 4. Associations Between Participant Characteristics and Membership in the Identified Alcohol-Related Latent Classes

Predictors	*P* value	At risk of drinking	High risk drinkers	Very high-risk drinkers
		OR (95%CI)	OR (95%CI)	OR (95%CI)
Age	0.1813	0.93 (0.80-1.08)	0.89 (0.77-1.02)	1.03 (0.94-1.13)
Sex (being male)	0.0055	*3.56 (1.40-9.01)	*2.96 (1.31-6.68)	1.48 (0.85-2.57)
Marital status (being single)	0.7063	1.86 (0.01-270.69)	1.64 (0.02-111.09)	0.44 (0.14-1.44)
Score of familial support	0.5287	0.98 (0.94-1.03)	0.97 (0.94-1.01)	0.98 (0.96-1.01)
Score of religiosity	0.0069	*0.97 (0.96-0.99)	0.99 (0.97-1.01)	*0.98 (0.97-0.99)

*Significant, The reference class: non-drinkers
OR: odds ratio
CI: confidence interval

As shown in Table 4, analysis of latent class membership indicated that family support, age, and marital status were not significantly associated with class membership, whereas sex and religiosity were. Specifically, males had higher odds of belonging to the at-risk (OR = 3.56, 95% CI: 1.40–9.01) and high-risk drinking classes (OR = 2.96, 95% CI: 1.31–6.68) than non-drinkers. Conversely, higher religiosity scores were associated with lower odds of membership in the at-risk (OR = 0.97, 95% CI: 0.96–0.99) and very high-risk drinking classes (OR = 0.98, 95% CI: 0.97–0.99) relative to non-drinkers. Previous studies have reported associations of male sex with higher levels of risky alcohol use and greater religiosity with lower alcohol consumption and related risk behaviors. However, in the present study, these associations varied across the identified latent classes.

Discussion

To our knowledge, this study is among the first to apply latent class analysis to examine alcohol consumption patterns among Iranian university students and their social circles, while also exploring the associations of religiosity and family support with latent class membership. Using latent class analysis, we identified four distinct latent classes within the student population: non-drinkers, at-risk drinkers, high-risk drinkers, and very high-risk drinkers. Notably, male sex was independently associated with higher odds of membership in the high-risk drinking classes, whereas higher religiosity was independently associated with lower odds of membership in these classes. Although the majority of students (approximately 88%) were classified as non-drinkers, about 6% belonged to the very high-risk drinking class, indicating the presence of a subgroup of students with substantial alcohol-related risk within this population.

Our findings are consistent with previous latent class analyses demonstrating similar clustering of alcohol-related and other health-risk behaviors across different populations. For example, studies of adolescents and college students in other contexts frequently identify multiple risk classes, including high-risk and very high-risk groups with prevalences comparable to ours (31). Additionally, in 2017, Afrashteh et al. evaluated the patterns of simultaneous high-risk behaviors among university students using LCA, which identified five latent classes: low risk, high risk, somewhat low risk, hookah user, and very high risk (4).

Higher religiosity was independently associated with lower odds of membership in higher-risk drinking classes. This finding is consistent with previous research suggesting that religiosity is associated with lower levels of substance use through mechanisms such as the promotion of moral values, adherence to behavioral norms, and access to supportive social networks. For instance, students who regularly attend religious services have been reported to be more likely to abstain from alcohol than those who do not (32). Similarly, Wells et al. found that students with low levels of religiosity had substantially higher odds of engaging in heavy alcohol use (33). In the Iranian context, where Islamic teachings prohibit alcohol consumption (34), religiosity may contribute to social and behavioral norms that discourage alcohol use. Collectively, these findings suggest that culturally appropriate prevention strategies may benefit from considering religiosity as one of several factors associated with alcohol-related behaviors among university students, including the incorporation of religious values into prevention programs where appropriate (35).

Unlike religiosity, family support was not independently associated with latent class membership after adjustment for potential confounders. Although previous studies have suggested that supportive family environments may influence alcohol-related behaviors by enhancing parental monitoring, communication, and emotional support, our findings did not demonstrate an independent association between family support and latent class membership in the multivariable latent class regression model. For example, Haghdoost et al. reported that close-knit family relationships and supportive parenting contribute to positive developmental outcomes in the Iranian context (36). Differences in study populations, cultural contexts, measurement approaches, and analytical strategies may partly explain the inconsistency between our findings and those of previous studies. Therefore, further longitudinal studies are warranted to clarify the role of family support in alcohol-related behaviors among Iranian university students.

Finally, regarding sex differences in the present study, male participants had significantly higher odds of membership in the at-risk and high-risk drinking classes than non-drinkers. Specifically, males had approximately 3.6-fold and 3.0-fold higher odds of belonging to the at-risk and high-risk drinking classes, respectively. These findings are consistent with previous studies suggesting that both cultural and individual factors may contribute to sex differences in engagement in high-risk behaviors. In the Iranian context, females often face greater social restrictions than males (36), while a review by Chris Dawson suggested that women generally exhibit greater sensitivity to potential losses and lower risk-taking propensity than men (37).

Limitations

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Several limitations should be considered when interpreting the findings of this study. First, the cross-sectional nature of the research does not allow causal relationships to be established. Second, alcohol consumption was self-reported and may have been affected by recall and social desirability biases. Given that alcohol use is both legally prohibited and socially stigmatized in Iran, underreporting may have led to underestimation of alcohol consumption prevalence and influenced latent class assignment. Third, several potentially important determinants of alcohol consumption, including smoking status, mental health, socioeconomic characteristics, and living arrangements, were unavailable for inclusion in the latent class regression model, and residual confounding cannot be excluded. In addition, alcohol use among family members and close friends served as latent class indicators and therefore could not be included as covariates.

Additionally, no formal sensitivity analyses were conducted to assess the robustness of the selected latent class model. Consequently, the stability of the identified class structure remains uncertain, and the findings should be interpreted with caution. A further limitation of the latent class enumeration was that BLRT and LMR-LRT were not available in the SAS version used for the analyses. Model selection criteria were not fully concordant: BIC and entropy favored the two-class solution, whereas AIC favored the four-class solution. Therefore, the selection of the four-class model involved consideration of statistical criteria together with class separation and substantive interpretability rather than reliance on a single fit index. Future studies using software that provides formal likelihood-ratio-based class enumeration procedures may further evaluate the robustness of the selected class solution.

Finally, because the study was conducted among university students from a single province in Iran, the generalizability of the findings may be limited. Future longitudinal studies including broader samples and more comprehensive measures of potential determinants are warranted to further clarify alcohol-related behaviors among Iranian university students.

Conclusion

Using latent class analysis, this study identified four distinct patterns of alcohol use and related social exposure among university students. The associations of religiosity and sex with latent class membership differed across classes, suggesting that these relationships were not uniform across alcohol-use patterns. No clear evidence of an independent association between family support and class membership was observed after adjustment for the included covariates. Given the cross-sectional design and limitations in statistical precision and confounder adjustment, these findings should be interpreted cautiously. Further longitudinal research is needed to better understand the relationships between religiosity, family support, sex, and alcohol-related behaviors among Iranian university students. These findings support the development of culturally appropriate alcohol prevention strategies that consider the influence of religiosity while highlighting the need for further research on family-related factors. Such efforts may assist universities and public health authorities in developing evidence-based interventions to reduce alcohol-related harm among university students.

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Conflict of Interests

The authors declare that they have no competing interests.

Authors' Contributions

N.D. and S.H.A. were responsible for the study conception and design, data collection and interpretation, and preparation and revision of the manuscript. A.A. conducted the statistical analyses and provided critical revisions to the manuscript. S.A. participated in designing the study and contributed to manuscript drafting and critical revision. N.I., A.R., and M.T. were involved in data curation, manuscript preparation, and critical revision. All authors reviewed and approved the final version of the manuscript.

Ethical Considerations

Ethical approval for this study was obtained from the Ethics Committee of Behbahan Faculty of Medical Sciences, Iran, under the approval code IR.BHN.REC.1399.012.

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Data Availability

The datasets generated and analyzed during the current study are not publicly accessible due to restrictions imposed by the ethics committee. Nevertheless, they may be obtained from the corresponding author upon reasonable request, subject to applicable ethical requirements.

AI Use Statement

The authors employed ChatGPT (OpenAI) exclusively to refine the language and enhance the clarity and readability of the manuscript. The tool was not involved in the study design, data collection, statistical analysis, interpretation of results, or development of scientific conclusions. All scientific content was carefully reviewed and verified by the authors, who retain full responsibility for the accuracy, integrity, and final content of the manuscript.

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