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Alcohol Consumption at Work in Construction Workers Employed in Small Italian Companies

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Abstract

Background: *Alcohol consumption is an important occupational risk factor, especially in safety-sensitive sectors such as construction. Alcohol-related psychomotor impairment may increase the risk of workplace injuries and may also affect the safety of third parties. However, data on alcohol-related behaviors, workers' risk perception, and alcohol-focused health surveillance among Italian construction workers are still limited.* **Methods:** *We conducted a cross-sectional survey between September 2023 and June 2024 in 315 construction workers employed in small Italian companies. All participants performed work activities for which local legislation mandates alcohol-use and alcohol-dependence checks as part of occupational health surveillance. Data were collected through an anonymous 27-item questionnaire exploring sociodemographic characteristics, alcohol consumption (AUDIT-C; cut-off ≥5 for men and ≥4 for women), alcohol use at work, knowledge of national regulations, alcohol-related risk perception, and accident/injury indicators. Nonparametric tests and multivariable linear regression were used to identify factors associated with AUDIT-C scores. Logistic regression analyses examined associations between perceived alcohol-related risks and awareness of, and exposure to, alcohol-dependence checks during health surveillance.* **Results:** *The sample was predominantly male (274/315; 86.98%), and 26.03% of workers were aged 46–55 years. The mean AUDIT-C score was 2.85±2.49 (3.13±2.47 in men; 0.95±1.75 in women); 32.7% of workers screened positive, mainly men. Alcohol consumption during the work shift was reported by 1.9% of participants (7.94% occasionally), and during breaks by 5.08% (19.37% occasionally). Most workers were aware of the workplace alcohol ban (90.48%), and 83.49% reported having undergone alcohol-related checks. Higher AUDIT-C scores were associated with alcohol consumption during the work shift and occasional drinking during breaks.* **Conclusions:** *Although average AUDIT-C scores were not high, a relevant subgroup of workers showed risky drinking patterns and some alcohol consumption at work. These findings highlight the need to strengthen prevention strategies and ensure consistent alcohol-related health surveillance in construction settings.*

1. Introduction

Alcohol consumption is currently one of the biggest challenges in public health, both because of its effects on human health and its potential social consequences [1]. From a health perspective, scientific evidence has demonstrated that alcohol consumption is associated with a causal link to over

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200 three-digit disease and injury codes in the International Statistical Classification of Diseases and Related Health Problems –10th Revision (ICD-10) [2], the most important of which are malignant neoplasms, mental, behavioral and neurological disorders, cardiovascular and gastrointestinal diseases [3]. In this regard, the Global Burden of Disease Study 2016 showed that, globally, 2.8 million deaths and 1.6%-6% (for females and males, respectively) of total Disability-Adjusted Life Years (DALYs) might be attributed to alcohol use [4]. On the other hand, alcohol consumption represents a significant impediment to the full achievement of several goals (SDGs) of the 2030 Agenda for Sustainable Development such as halve the number of global deaths and injuries from road traffic accidents (SDG 3.6), eliminate all forms of violence against all women and girls in the public and private spheres (SDG 5.2), reduce all forms of violence and related death rates everywhere (SDG 16.1) and end abuse, exploitation, trafficking and all forms of violence against and torture of children (SDG 16.2). Therefore, taking into account these considerations, it is not surprising that the World Health Organization (WHO), pointing out the urgent need for comprehensive strategies and policies to address alcohol-related issues and raise awareness about alcohol-related risks, developed the "Global Alcohol Action Plan 2022–2030" to define and boost the effective implementation of goals and actions to reduce the harmful use of alcohol and related morbidity, mortality and social consequences [3]. Interestingly, the previous document also highlighted how the harms deriving from alcohol consumption can have significant consequences not only for the drinker but also for their social and work relationships (e.g., family members, friends and co-workers) and, in particular, in this context, special emphasis is placed on road traffic injuries [3]. In this context, WHO estimates indicated that in 2016, of the 0.9 million injury deaths attributable to alcohol (accounting for 28.7% of all alcohol-attributable deaths worldwide), 370,000 were due to road injuries, and of these, 187,000 alcohol-attributable deaths occurred among people other than drivers [5]. This aspect is particularly relevant from an occupational medicine perspective, since the psychoactive effects of alcohol (e.g., drowsiness, impaired judgment and decision-making, slowed thinking and reaction time) [6] increase the risk of accidents at work, particularly in certain specific working activities (i.e., professional driving) or work environments (i.e., construction or agricultural sectors) where maintaining optimal perception, attention, and psychomotor coordination is essential [7-10]. In this regard, it is worth noting that, although it is particularly complex and difficult to determine the role of alcohol consumption in the occurrence of work-related injuries, it has been estimated that 10–30% of workplace accidents are alcohol-related, and that problem drinkers face a 2–4 times higher risk of experiencing a workplace accident than non-drinkers [11]. Therefore, although precise figures for the number of these alcohol-attributable adverse events are unavailable, it is widely recognized that alcohol consumption might play a significant causal role, especially in working activities with a higher inherent risk of injury [12-16]. In Italy, occupational health surveillance primarily focuses on protecting workers' health and safety while also considering the potential risks to third parties from alcohol-impaired work-related conduct. However, across Europe, approaches to alcohol-related issues in the workplace remain highly fragmented and heterogeneous, reflecting substantial differences in legislative frameworks, regulatory strategies, and organizational practices [17].

Therefore, it is quite evident that addressing alcohol consumption in the workplace (whether habitual or occasional) clearly constitutes a fundamental pillar of strategies and policies aimed at preventing occupational accidents. For example, in Italy, the framework law on alcohol and alcohol-related problems (Law No. 125/2001) introduced a ban on the consumption and serving of alcoholic beverages and spirits for certain work activities that entail a high risk of workplace accidents and include, among others, the healthcare professions, teaching activities, road vehicle driving, and work at heights exceeding two meters listed in the resolution adopted by the Permanent Conference for Relations between the State and the Regions. In addition, the main framework on occupational health and safety (Legislative Decree 81/08) provides that, in conducting different health-surveillance medical examinations (for those

workers who effectively perform the aforementioned working tasks) the occupational physician (OP) must also assess the alcohol dependence and the use of psychotropic and narcotic substances, in order to protect both workers' health and safety and the safety of third parties. However, screening employees for alcohol use in the workplace is a complex and contentious topic involving moral, ethical, and practical issues. Regarding this latter aspect, although assessing the absence of alcohol consumption is mandatory, it is important to highlight that clear, unequivocal guidance on the conditions and methods for conducting this assessment remains lacking.

In this context, the present study examined risk perception of workplace accidents associated with alcohol use among a sample of construction workers undergoing targeted occupational health surveillance designed to monitor alcohol consumption at work and to identify alcohol dependence-related problems, to pinpoint gaps and critical issues in current practice and consequently to inform improvements to existing measures for the prevention of, and protection from, alcohol-related occupational accidents.

2. Methods

2.1. Setting and Participants

This cross-sectional study was conducted between September 2023 and June 2024 in a convenience sample of Italian construction workers employed by several small companies (10–30 employees) operating in the construction sector in a region of Southern Italy. Eligibility for participation in the survey, and consequent inclusion in the study, required: (i) employment as a construction worker, (ii) performance of at least one work activity included in the resolution of the Permanent Conference for Relations between the State and the Regions, (iii) age ≥18 years and (iv) provision of written informed consent to participate and to the potential future publication of the results in anonymized, aggregated form.

2.2. Recruitment Strategy and Data Collection

A convenience sampling strategy was adopted. Initially, OPs (as well as other professionals involved in the occupational safety and health system) working locally with construction companies (where activities and tasks were performed that, for selected groups of workers, required mandatory assessment of alcohol use) were contacted. After being informed of the study's purpose, sampling strategy, and data collection and analysis procedures, the professionals were asked to assist in recruiting workers from their companies. Subsequently, in the companies identified through this process, workers potentially eligible for the study (according to the above-mentioned inclusion criteria) were invited to participate in the survey. Workers were informed about the aims, study protocol, and methodologies during routine occupational health surveillance or training activities. They were invited to participate voluntarily, and the questionnaire was completed anonymously. A link to the online questionnaire (hosted on the Microsoft platform) was sent to all subjects who expressed interest in participating in the study. In this regard, it should be noted that access to the survey questionnaire was conditional on reading an information cover letter, which reiterated the details previously provided to potential participants regarding the aims of the study and the related data collection and data processing procedures. Likewise, the actual filling in of the questionnaire was contingent upon participants' confirmation of informed consent, both to take part in the study and to the potential future publication of the results in anonymized and aggregated form. All data were collected anonymously, and no information that could identify individual participants was recorded at any stage. The study received ethical approval from the local Ethics Committee for Scientific Research (CERS) (Comitato Etico Territoriale Lazio Area 3, protocol ID 6014/2023) and was conducted under the principles of the Declaration of Helsinki.

2.3. Questionnaire

In line with the aims of the present study, a structured questionnaire was developed to obtain valuable information on issues related to the topic under investigation.

The questionnaire consisted of 5 sections, totaling 27 items. The first section (7 items) investigated the

participants' socio-demographic characteristics. The second part is related to the habits regarding alcohol consumption with the use of the Alcohol Use Disorders Identification Test-Consumption (AUDIT-C, the cut-off level was set to ≥4 for women and ≥5 for men) test [18] and three further questions on alcohol consumption habits at work and the possible presence of alcohol-related problems within the family. In this regard, it should be noted that the AUDIT-C questionnaire was completed assuming that one alcoholic drink corresponds to 12 grams of alcohol, which is equivalent to 330 ml of beer, a standard glass of wine, or a serving of spirits. The third section (5 items) was elaborated to assess knowledge of current national laws and regulations on alcohol consumption in the workplace, whereas the fourth section (3 items) asked about alcohol-related risk perception. The fifth and final section (5 items) investigated any injuries or accidents that may be potentially alcohol related. With the exception of the items included in the short version of the AUDIT tool, the other survey items and questions could not be directly extrapolated or adapted from any existing questionnaire and consequently they were developed specifically for this study, drawing on prior experience, the available literature, and the current Italian regulatory framework for the control of alcohol use in workplaces, with the aim of obtaining reliable data on the variables of interest [19].

2.4. Statistical Analysis

We performed descriptive statistics to characterize the socio-demographic aspects of participants and the characteristics of the study variables, which were presented as frequencies and percentages. To study the correlation between the AUDIT-C score and the categorical variables, we performed nonparametric tests: for the dichotomic variable, we used the Mann-Whitney U test, and for the variable with more than two groups, we used the Kruskal-Wallis test. In a second stage, the variables showing significant associations in bivariate analyses were entered together in a final multiple linear regression. No formal correction for multiple comparisons was applied, as the analyses were primarily exploratory and aimed at identifying potential associations between alcohol consumption patterns and occupational safety indicators. To analyze the collected data, we used STATA 16.

3. Results

3.1. Socio-Demographic Characteristics of Participants

The population surveyed consisted of a final sample of 315 construction workers, predominantly male (n=274, 86.98%). Twelve persons (3.81%) had completed primary school; most participants had completed secondary or lower secondary school (n=216, 68.57%; n=70, 22.22%, respectively), while only 5.40% (n=17) of recruited workers held a university degree. With regard to the specific occupational task (namely, work activities for which health surveillance is also mandated with respect to alcohol consumption), most workers were employed as bricklayers (n=83, 26.35%), followed by general construction laborers (n=72, 22.86%). In this regard, it is noteworthy that approximately two-thirds of the study population had a long length of service (33.97% and 32.38% in the range of 5-15 years and 16-30 years, respectively), a finding of particular relevance given that limited professional experience has been identified as an important determinant of work-related injury [20].

3.2. Alcohol Use Disorders Identification Test-Consumption (AUDIT-C) and Alcohol Consumption Habits in the Workplace

In Table 1, the information obtained from the administration of the AUDIT-C tool and the findings concerning the alcohol consumption habits in the workplace and alcohol-related issues in the family are reported. Overall, in the entire study population, the mean AUDIT-C score was 2.85±2.49, thus indicating that alcohol consumption was not generally indicative of problematic drinking patterns. However, the results also showed a marked gender difference, as the mean score was higher in male than in female workers (3.13±2.47 *vs* 0.95±1.75), suggesting a greater tendency toward hazardous drinking among men. This interpretation would be further

Table 1. Results on alcohol consumption habits (section 2 of the questionnaire).

AUDIT-C mean scores – Entire study population (n=315)		
Reference groups	**Mean score (± SD)**	**AUDIT-C range of scores**
All workers	2.85±2.49	
Male workers (n=274)	3.13±2.47	0-12
Female workers (n=41)	0.95±1.75	
AUDIT-C mean scores – Participants with a positive AUDIT-C score* (n=103, 32.7%)		
Reference groups	**Mean score (± SD)**	**AUDIT-C range of scores**
All workers	5.82±1.43	4-12
Male workers (n=99)	5.84±1.44	5-12
Female workers (n=4)	5.5±1.29	4-12
Alcohol consumption habits in the workplace and alcohol-related issues in the family		
Alcohol consumption during the work shift – n (%)	Yes	6 (1.9%)
	No	284 (90.16%)
	Occasionally	25 (7.94%)
Alcohol consumption during work breaks – n (%)	Yes	16 (5.08%)
	No	238 (75.56%)
	Occasionally	61 (19.37%)
Family history of alcohol-related issues – n (%)	Yes	66 (20.95%)
	No	249 (79.05%)

** A positive AUDIT-C score (indicative of potentially hazardous alcohol consumption) is defined as a score ≥5 for men and ≥4 for women.*

corroborated by data among participants with a positive AUDIT-C score, since the percentage of male workers who tested positive in the AUDIT-C was 32.7%, while this percentage fell to 9.75% among female colleagues (however this gender-specific result should be considered with caution given the substantial imbalance in the number of male (n=274) and female (n=41) participants which may affect the precision and comparability of the data). Interestingly, the average scores observed in the different groups of workers (total, males and females) who tested positive in AUDIT-C were essentially comparable to each other.

Regarding the workplace context, alcohol consumption during the work shift was rarely reported (1.9% and 7.94% of participants answered "yes" and "occasionally", respectively) but higher frequencies were observed during work breaks (5.08% and 19.37% for "yes" and "occasionally" options, respectively). This finding has been particularly surprising because Italian Law No. 125/2001 explicitly prohibits both the consumption and the serving of alcoholic beverages in the workplace for the working activities associated with a higher risk of occupational injuries (such as those performed by the workers included in this study). At the same time, this data is also particularly worrying as a non-negligible proportion of workers reported alcohol consumption in the workplace, which may have implications for safety, job performance, and the risk of work-related accidents.

Finally, concerning the last item in this section (that evaluated whether participants had relatives with known alcohol-related issues), 20.95% of the sample reported a family history of alcohol-related problems, which might represent a vulnerability or hyper-susceptibility (if only psychological) factor

for a greater tendency toward possible risky alcohol consumption.

3.3. Knowledge of Current National Laws About Alcohol Consumption in the Workplace

The items in this section of the survey explored participants' level of knowledge regarding the main Italian laws regulating alcohol consumption in the workplace (Law No. 125/2001) as well as the related control measures implemented through occupational health surveillance as provided for by Legislative Decree 81/08. In this context, previous information on occasional alcohol consumption in the workplace appears even more remarkable in light of the fact that most workers (90.48%) were aware that Italian Law No. 125/2001 prohibits alcohol consumption at work, and a similarly high proportion (89.84%) knew that occupational health surveillance may include controls to check alcohol dependence.

Importantly, 83.49% of workers were actually subjected (during health surveillance medical examinations) to tests aimed at assessing alcohol dependence, which effectively demonstrates that such control measures are not merely theoretical but are commonly implemented in practice by OPs. Nevertheless, it is perplexing that a sizeable proportion of workers (16.51%) did not report undergoing such checks, given that the professional tasks they perform are legally expected to be covered by alcohol-related controls.

With regard to participation in information and training courses on alcohol-related workplace issues, the majority of participants stated that they had received training on this topic (87.30%), even if the issue concerning the risk to third parties (i.e., involvement of and consequences for other people such as family members, friends and co-workers) seems to have been insufficiently addressed (22.22% not addressed).

3.4. Alcohol-Related Risk Perception

The results of the survey fourth section (Table 2) are focused on the workers' alcohol-related risk perception. In this regard, concerning the measures that could be taken by the employer if alcohol-related issues were detected, most respondents reported that they would expect disciplinary sanctions to be imposed (52.38%) or, alternatively, the implementation of supportive interventions (i.e., specific counseling) (19.05%), but a non-negligible proportion of workers (21.27%) were unable to answer this question. With respect to the level of agreement among workers regarding the usefulness of prevention programs in improving alcohol-related issues in the workplace, the data showed that an overwhelming majority of workers were "Strongly agree" and "Somewhat agree" (24.13% and 57.78%, respectively) with this sentence. Similar trends were also observed for the perceived safety implications, with response percentages strongly skewed toward complete or partial agreement that alcohol consumption in the workplace might actually pose a risk to one's own safety, to that of colleagues but also of third parties, thus suggesting a broad awareness on this topic. Indeed, this perception is further supported by the data of the latest question, which unequivocally indicated that most of participants perceive that alcohol consumption may play a role in adversely influencing a wide range of outcomes across occupational, family, social, and individual domains.

3.5. Road Traffic Accidents and Work-Related Injuries

In Table 3 are reported the anamnestic information regarding road traffic accidents and work-related injuries together with possible indicators of their potential association with alcohol use (e.g., driving licence restrictions or alcohol test results). In the study sample, nearly one-fifth of participants (17.78%) had been victims of a work-related injury in the three years preceding the survey, while an even smaller percentage of workers (9.52%) had been involved in a road traffic accident in the previous five years. Concerning the alcohol-related indicators, although relatively few workers had their driving licences restricted (13.33%) or had tested positive on a breathalyzer (n=28), these data still suggest further attention, as targeted prevention strategies and policies (also in the workplace) could help in minimizing the risk of alcohol-related road traffic accidents and/or work-related injuries.

Table 2. Results on alcohol-related risk perception.

Items	Response options - n (%)				
How would the company respond if alcohol-related issues were identified?	**Disciplinary actions**	**Assistance programs**	**The company wouldn't take any action**	**I don't know**	
	165 (52.38%)	60 (19.05%)	23 (7.30%)	67 (21.27%)	
Indicate how much you agree with the following statement: prevention programs improve alcohol-related issues in the workplace	**Strongly agree**	**Somewhat agree**	**Somewhat disagree**	**Strongly disagree**	
	76 (24.13%)	182 (57.78%)	38 (12.06%)	19 (6.03%)	
Indicate how much you agree with the following statement: alcohol consumption in the workplace can be a risk factor for …	**Strongly agree**	**Somewhat agree**	**Somewhat disagree**	**Strongly disagree**	
your own workplace safety	223 (70.79%)	68 (21.59%)	16 (5.08%)	8 (2.54%)	
your co-workers' safety	208 (66.03%)	82 (26.03%)	19 (6.03%)	6 (1.90%)	
others' workplace safety	226 (71.75%)	59 (18.73%)	22 (6.98%)	8 (2.54%)	
In your opinion, how much can alcohol consumption affect the following conditions?	**Very much**	**Considerably**	**Fairly**	**Slightly**	**Not at all**
Road traffic accidents	205 (65.08%)	56 (17.78%)	18 (5.72%)	6 (1.90%)	30 (9.52%)
Workplace injuries	191 (60.63%)	59 (18.73%)	39 (12.38%)	12 (3.81%)	14 (4.44%)
Decreased attention	157 (49.84%)	91 (28.89%)	43 (13.65%)	11 (3.49%)	13 (4.13%)
Reduced work performance	147 (46.67%)	83 (26.35%)	60 (19.04%)	11 (3.49%)	14 (4.44%)
Disciplinary actions	171 (54.29%)	77 (24.44%)	38 (12.06%)	18 (5.71%)	11 (3.49%)
Onset of disease	192 (60.95%)	72 (22.86%)	32 (10.16%)	9 (2.86%)	10 (3.17%)
Domestic violence	211 (66.98%)	51 (16.19%)	34 (10.79%)	7 (2.22%)	12 (3.81%)
Workplace disputes	175 (55.56%)	55 (17.46%)	58 (18.41%)	13 (4.13%)	14 (4.44%)
Poor workplace relationships	156 (49.52%)	81 (25.71%)	50 (15.87%)	12 (3.81%)	16 (5.08%)
Increased costs for companies	153 (48.57%)	63 (20.00%)	51 (16.9%)	21 (6.67%)	27 (8.57%)
Workplace absenteeism	164 (52.06%)	64 (20.32%)	51 (16.9%)	18 (5.71%)	18 (5.71%)

3.6. Associations Between AUDIT-C Scores and Socio-Demographic Characteristics, Occupational Role and Alcohol-Related Workplace Behaviors

The linear regression analysis examined the potential links between AUDIT-C scores and various variables surveyed (Table 4). Most socio-demographic characteristics and occupational features were not significantly related to AUDIT-C data. However, a statistically significant connection was found for secondary school qualification, and overall, the analysis indicated a possible trend toward

Table 3. Results on road traffic accidents and work-related injuries.

	Response options - n (%)	
Items	**Yes**	**No**
Have you experienced any work-related injuries in the past three years?	56 (17.78%)	259 (82.22%)
Have you experienced any road traffic accidents in the past five years?	30 (9.52%)	285 (90.48%)
In the past five years, have you been subject to any measures affecting your driving licence such as points deducted (due to alcohol-related issues)?	42 (13.33%)	273 (86.67%)
Have you ever undergone a breathalyzer test following a police roadside check?	85 (26.98%)	230 (73.02%)
… if yes, was the result positive for alcohol?	28 (32.94%)	57 (67.06%)

Table 4. Linear regression analysis with mean scores AUDIT-C.

Variables	**Coeff.**	**St. Err.**	**CI 95%**	***p* – value**	
Gender	Male *	0	-	-	-
	Female	-0.363	0.345	[-1.043, 0.316]	0.293
Age	18-25 *	0	-	-	-
	26-35	0.322	0.409	[-0.483, 1.128]	0.432
	36-45	0.072	0.527	[-0.966, 1.11]	0.891
	46-55	-0.463	0.625	[-1.693, 0.767]	0.46
	>55	-0.275	0.744	[-1.74, 1.19]	0.712
Educational Level	Primary School *	0	-	-	-
	Lower secondary school	0.482	0.557	[-0.614, 1.577]	0.388
	Secondary school	1.155	0.553	[-0.67, 2.244]	**0.038**
	Degree	1.22	0.7	[-0.159, 2.598]	0.083
Specific job role	Bricklayer *	0	-	-	-
	Construction laborer	0.153	0.327	[-0.490, 0.796]	0.64
	Truck driver	-0.033	0.362	[-0.745, 0.680]	0.928
	Site manager	0.199	0.393	[-0.574, 0.972]	0.613
	Tower crane operator	-0.437	0.501	[-1.423, 0.548]	0.383
	Other	-0.225	0.326	[-0.867, 0.417]	0.491
Length of service	<5 *	0	-	-	-
	5-15	0.291	0.408	[-0.512, 1.094]	0.476
	16-30	1.15	0.546	[0.074, 2.225]	**0.036**
	>30	0.66	0.716	[-0.749, 2.068]	0.357
Alcohol consumption during the work shift	No *	0	-	-	-
	Yes	3.334	0.931	[1.501, 5.167]	**<0.001**
	Occasionally	0.571	0.487	[-0.387, 1.529]	0.242
Alcohol consumption during work breaks	No *	0	-	-	-
	Yes	0.918	0.576	[-0.217, 2.052]	0.113
	Occasionally	0.93	0.384	[0.174, 1.687]	**0.016**

Variables	Coeff.	St. Err.	CI 95%	*p* – value	
Are you aware that there is an Italian law (Law No. 125/2001) prohibiting alcohol consumption in the workplace?	Yes *	0	-	-	-
	No	0.739	0.455	[-0.157, 1.636]	0.106
During the health surveillance medical examination, were you checked for alcohol dependence?	Yes *	0	-	-	-
	No	0.487	0.462	[-0.423, 1.396]	0.293
Have you received information and training courses on alcohol-related workplace issues?	Yes *	0	-	-	-
	No	-0.486	0.401	[-1.275, 0.303]	0.226
During courses, was the risk to third parties associated to alcohol consumption at work addressed?	Yes *	0	-	-	-
	No	0.927	0.337	[0.264, 1.590]	**0.006**
How would the company respond if alcohol-related issues were identified?	The company wouldn't take any action *	0	-	-	-
	I don't know	-1.068	0.436	[-1.927, -0.210]	**0.015**
	Assistance programs	-0.616	0.443	[-1.488, 0.257]	0.166
	Disciplinary actions	0.327	0.435	[-0.530, 1.184]	0.453
Indicate how much you agree with the statement: prevention programs improve alcohol-related issues in the workplace	Strongly disagree *	0	-	-	-
	Somewhat disagree	-0.661	0.537	[-1.718, 0.396]	0.220
	Somewhat agree	-0.486	0.488	[-1.447, 0.475]	0.321
	Strongly agree	-1.02	0.515	[-2.034, -0.006]	**0.049**

** reference category used in the regression models.*

higher AUDIT-C scores with increasing education level. Additionally, regarding professional covariates, workers with 16-30 years of service had significantly higher AUDIT-C scores compared to colleagues with less than 5 years of seniority, while the other groups showed small, non-significant differences.

Interestingly, a strong association (p<0.001) was found between AUDIT-C scores and alcohol consumption habits, as participants who reported drinking alcohol during the work shift or occasionally during breaks had significantly higher AUDIT-C scores (β=3.334; 95% CI 1.501, 5.167, p<0.001 and β=0.93; 95% CI 0.174, 1.687, p=0.016, respectively). A possible disconnect between risk communication and risky drinking behaviors is suggested by the statistically significant association observed in those who reported that information and training courses on alcohol-related workplace issues did not address the risk to third parties. Finally, the analysis supports the hypothesis that workers who had lower AUDIT-C scores consider workplace initiatives and measures to prevent alcohol-related problems to be particularly important.

3.7. Perceived Alcohol-Related Risk and Health Examinations for Alcohol Dependence

The logistic regression analysis data showed that the workers' perception of the alcohol contributing role to road traffic accidents was strongly associated

with greater awareness that health surveillance medical examinations may include (for specific working tasks) control for alcohol dependence (Table 5).

Similar results were also observed with regard to the self-reported execution of alcohol-dependence targeted checks during the medical examination. Moreover, the same statistically significant correlation was found for the reduced work performance. In this context, a higher level of awareness would have been expected to be also associated with a greater perception of alcohol influence on workplace injuries, while instead the findings would suggest the opposite.

4. Discussion

Intending to ensure the highest level of workers' health and safety, the definition and implementation of multidisciplinary policies and strategies that integrate health promotion, accident prevention, and measures to control, prevent, mitigate, and address alcohol use and dependence in the workplace still remain one of the most important challenges in occupational medicine today. The magnitude of this problem is underscored by recent International Labour Organization figures reporting that every year, globally, 395 million workers suffer work-related injuries, of which (again according to ILO estimates) between 10 and 30% are more or less directly connected to alcohol consumption [11, 21]. These data are unsurprising, given that the potential contribution of risky alcohol consumption to various adverse outcomes, such as work-related injuries or road traffic and domestic accidents, is well established [22-24], and it aligns with alcohol's well-recognized effects on psychomotor and cognitive functions, including impaired coordination, perception, attention, and judgment [25]. It is important to highlight that, in terms of increased risk of injury at work, these adverse effects of alcohol are especially significant in activities where workers are exposed to hazards and safety-critical tasks (e.g., operating heavy machinery, working at heights, professional driving, using power tools, or handling dangerous equipment such as explosives), where maintaining psycho-physical fitness (and thus avoiding alcohol-related impairment) is essential for performing duties safely [26-27].

In this context, the findings of the present cross-sectional survey, conducted on Italian construction workers undergoing targeted health surveillance to also monitor alcohol dependence, offer a detailed overview of workplace alcohol use behaviors, risky alcohol consumption, perceptions of alcohol-related risk, health surveillance activities, and the relationships between these dimensions. These findings provide noteworthy insights for discussion and help identify priority areas for intervention to further reduce the risk of alcohol-related accidents at work. First, an interesting initial finding emerged from the analysis of AUDIT-C data, since even though the average score in the study population was not particularly high (thus not suggesting a problem of possible hazardous alcohol consumption), nearly one-third of participants (almost all male workers) tested positive. This is a highly important and serious concern, especially in the construction sector where, even an occasional impairment while performing safety-sensitive tasks and activities (e.g., working at height, operating heavy machinery, driving) could cause disproportionate and potentially catastrophic consequences for workers' health and safety [28]. Therefore, it seems clear that there is an urgent need to improve, strengthen, and expand the application of context-specific workplace policies and strategies. These should combine periodic health surveillance medical examinations with evidence-based education, health promotion programs, and targeted support interventions aimed at discouraging hazardous alcohol use and reducing alcohol-related risks, particularly among male workers.

Furthermore, it should also be considered that, although the AUDIT-C tool is one of the few validated tests for assessing alcohol consumption in occupational settings, its reliability might be affected in non-anonymous contexts such as workplace health surveillance medical exams. Indeed, concerns about professional consequences and implications can lead to response bias and intentional underreporting, increasing the risk of false-negative results and limiting its usefulness in occupational history [29-30]. In this regard, the occupational safety and health system should be involved in promoting honest disclosure during AUDIT-C screening within health surveillance to reduce underreporting

Table 5. Associations (Logistic Regression analysis) between perceived alcohol-related risk and (A) awareness of and (B) exposure to health surveillance medical examinations aimed at assessing alcohol dependence.

A - Do you know that health surveillance may include (for specific working tasks) control for alcohol dependence?		**Odds Ratio**	**St. Err.**	**95% CI**	***p* – value**
In your opinion, how much can alcohol consumption affect the following conditions?	Road traffic accidents	1.738	0.464	[1.030, 2.934]	**0.038**
	Workplace injuries	0.579	0.142	[0.359, 0.935]	**0.025**
	Decreased attention	0.487	0.201	[0.218, 1.092]	0.081
	Reduced work performance	1.548	0.746	[0.603, 3.979]	0.364
	Disciplinary actions	0.533	0.152	[0.305, 0.932]	**0.027**
	Onset of disease	1.851	0.647	[0.934, 3.671]	0.078
	Domestic violence	0.546	0.229	[0.241, 1.240]	0.148
	Workplace disputes	0.9	0.346	[0.423, 1.913]	0.784
	Poor workplace relationships	1.007	0.336	[0.524, 1.938]	0.982
	Increased costs for companies	1.003	0.344	[0.512, 1.966]	0.993
	Workplace absenteeism	1.375	0.501	[0.673, 2.808]	0.383
B - In this regard, during the health surveillance medical examination, were you checked for alcohol dependence?					
In your opinion, how much can alcohol consumption affect the following conditions?	Road traffic accidents	4.024	1.422	[2.013, 8.043]	**<0.01**
	Workplace injuries	0.882	0.218	[0.544, 1.431]	0.611
	Decreased attention	0.42	0.141	[0.218, 0.810]	**0.01**
	Reduced work performance	2.436	0.947	[1.137, 5.219]	**0.022**
	Disciplinary actions	0.463	0.118	[0.280, 0.764]	**0.003**
	Onset of disease	1.121	0.313	[0.648, 1.937]	0.684
	Domestic violence	0.404	0.127	[0.218, 0.747]	**0.004**
	Workplace disputes	1.174	0.299	[0.713, 1.933]	0.529
	Poor workplace relationships	0.956	0.284	[0.534, 1.710]	0.878
	Increased costs for companies	0.882	0.267	[0.488, 1.596]	0.679
	Workplace absenteeism	0.912	0.285	[0.495, 1.682]	0.769

Multivariable logistic regression model. Odds ratios represent the change in the odds of the outcome associated with a one-unit increase in each predictor measured on a five-point Likert scale.

and enable effective prevention strategies. Possible approaches to explore include integrating screening within a clearly non-punitive prevention and support framework, training occupational health professionals in stigma-free communication, and most importantly, providing workers with clear and comprehensive information about legal requirements regarding alcohol consumption at work and the potential consequences of non-compliance. These considerations become even more relevant when analyzing the results concerning alcohol consumption habits at the workplace. Although the vast majority of respondents reported being aware that alcohol consumption is prohibited during certain safety-sensitive activities and that health surveillance may include alcohol-dependence assessments, an alarmingly high percentage of workers (many with higher average AUDIT-C scores, Table 4) admitted to drinking alcohol—either regularly or occasionally—during work hours, especially during breaks. This data, which cannot be easily explained by low awareness of legal obligations or poor perception of alcohol-related risks (both of which are notably high in the survey, Tables 3 and 4), certainly

warrants further investigation and calls for a careful review of how workers are trained and informed about this issue in the workplace. Knowledge alone is clearly insufficient; occupational-specific guidelines and workplace organizational culture are likely to play a key role [31-32].

Regarding the usefulness of prevention programs in addressing alcohol-related issues in the workplace, the linear regression analysis model highlighted that workers who strongly agreed with this view also had lower AUDIT-C scores. This observation may support the hypothesis that prevention initiatives are more likely to be endorsed by workers who are already at lower risk, while higher-risk individuals may be less convinced, less engaged, or more defensive. In practical terms, this suggests that universal and generic prevention messages or tools, although important, might be inadequate for these groups and should be complemented with tailored approaches that reduce stigma, clarify confidentiality limits, and emphasize support rather than punishment.

This study benefits from focusing on a safety-relevant workforce and integrating behavioral measures (AUDIT-C and workplace drinking habits), legal/organizational knowledge, risk perceptions, and accident-related indicators into a single, coherent questionnaire. However, several limitations should be considered. The cross-sectional design prevents causal inferences or conclusions about the direction of associations. Participants were recruited voluntarily during routine occupational health surveillance in small construction companies, representing a convenience sample with possible selection bias, as workers with particular attitudes toward alcohol or health issues may have been more likely to participate. The study was conducted within a specific occupational sector and region, with a predominantly male sample, which may limit generalizability. Additionally, as with most self-administered questionnaires on sensitive behaviors like alcohol use, data may be affected by recall and social desirability biases, potentially underreporting risky behaviors. Some estimates showed wide confidence intervals, especially in the regression analyses (Tables 4 and 5), likely due to limited observations in certain response categories and the variability of perception-based variables. These should be interpreted cautiously, although the overall associations were consistent. Importantly, the questionnaire was completed anonymously and privately to minimize reporting bias and protect privacy.

5. Conclusion

Although the overall AUDIT-C profile did not indicate widespread excessive alcohol consumption, the combined evidence of a significant at-risk subgroup, reported alcohol use during breaks and occasional consumption during work shifts, incomplete health surveillance coverage, and a perception of alcohol-related risk focused mainly on traffic accidents (but not equally on occupational accidents) highlights clear opportunities for strengthening prevention. Improving the consistency and scope of health surveillance, better aligning training with occupational injury prevention (including third-party risks), and adopting supportive, non-stigmatizing engagement strategies can help reduce alcohol-related harm in this high-risk work environment.

With regard to future research, longitudinal studies should clarify the temporal relationships between training, health surveillance, medical examinations, changes in risk perception, and consequent behaviors related to alcohol consumption. At the same time, the evaluation of targeted, context-specific interventions (particularly those addressing alcohol consumption during breaks and third-party safety) will be useful for determining which models, strategies, and policies work best in the construction industry.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

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