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NUTRITIONAL STATUS OF ALCOHOLICS IN PERI-URBAN AREAS OF THE GREATER ACCRA REGION OF GHANA

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ABSTRACT

Alcoholism is a common problem in developing countries. Epidemiological studies on the relationship among excessive alcohol consumption, malnutrition and anaemia are inconclusive. The present study examined the association between alcohol intake and nutritional status of alcoholics in the Greater Accra Region of Ghana. The study was cross-sectional involving 107 participants (men and women) aged between 20 and 76 years. Participants were identified as alcoholics after screening with a combined, but modified CAGE and AUDIT questionnaires. Anthropometric data including weight, biceps skinfold thickness, triceps skinfold thickness, hip circumference and waist circumference were collected. Body mass index (BMI) and Waist-to-hip ratio were computed using appropriate measures. Haemoglobin levels of participants were also assessed. Dietary intakes of respondents were estimated by 24-hour recall which was further converted into nutrients and energy using ESHA food processor. A pretested questionnaire was also used to obtain data on socio-demographic and lifestyle characteristics of participants. Differences between participants based on level of alcohol intake and correlations among variables were tested for statistical significance using ANOVA and correlation analyses, respectively. Logistic regression was performed to examine the relationship between levels of total ethanol intake and overweight and obesity factors while controlling for age, smoking status, physical activity and total energy intake. There was an inverse correlation between triceps skinfold and level of alcohol consumption irrespective of predominant type of alcoholic beverage consumed (r= -0.213, P= 0.028). Further, there was a positive correlation between alcohol consumption and hip circumference among predominant beer consumers (r= 0.585, P= 0.046). A strong positive correlation was observed between alcohol intake and haemoglobin concentration for women (r= 0.729, P= 0.040) but not among men (r= -0.053, P= 0.722). Predominant beer consumers tend to have higher weight and BMI. Moderate level of total ethanol intake was associated with greater odds of being overweight/obese, whereas high levels of intake was associated with lower odds of being overweight/obesity although these were not statistically significant. The mechanisms for the observation of higher weight, BMI and hip circumference among predominant beer consumers in this population need further exploration.

Key words: Alcoholics, alcoholic beverages, nutritional status

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INTRODUCTION

It is widely accepted that the obesity pandemic poses a serious threat to modern health care and economy of nations through rising health care costs [1, 2, 3]. Extensive research has been directed towards both understanding how and why obesity occurs and towards identifying effective ways to prevent and manage obesity [4]. Although some serious research has found alcohol consumption to be associated with obesity, other studies have challenged this association [2, 3, 5].

There is a disparity between urban and rural consumers in terms of expenditure on alcohol and the types of alcohol consumed. In Ghana, surveillance data on yearly alcohol intake are limited; however, the Ghana Living Standards Survey in 2008 noted that urban locality spends 1.0 per cent of their total expenditure on alcohol and tobacco products while their rural counterpart spends 3.1 per cent [6]. The urban population, which is far more affluent than rural areas, is more likely to purchase beer or other bottled alcohol than rely on locally-produced alcohols like palm wines. In addition, few studies on the association between alcohol consumption and nutritional status have been done in developed countries with scarce information on developing countries particularly Ghana. Also, the potential confounding role of dietary habits and ethnic differences in the association between alcohol consumption and nutritional status have been recognized in some countries [7, 8, 9, 10, 11]. Thus, identifying the association between alcohol consumption and nutritional status in Ghana is timely and significant.

Excessive alcohol intake is associated with nearly every chronic disease, ranging from hepatitis and fatty liver, cirrhosis, heart and vascular disease, gastric ulcers, exacerbated diabetes and more. The impact and consequences of alcohol is complex and it is also documented that chronic ingestion of ethanol alters the hematopoietic system resulting in folate deficiency [12]. Although the mechanisms by which ethanol causes anaemia have been well described, some facts remain to be elucidated as recent studies indicate that alcoholics tend to have iron stores that are greater than normal [13, 14]. As far as is known, no previous study has determined the association between alcohol consumption and haemoglobin concentration in adult alcoholics in Ghana. In this study, associations between alcohol intake and nutritional status of alcoholics in the adult population of three selected suburbs in the Greater Accra Region of Ghana were examined.

METHODOLOGY

Study design and setting

This cross-sectional study used a residential sample of adults in three locations namely Madina, Boi and Akporman of the Ga East Municipality all within the Greater Accra Region. The Ghana Living Standards Survey focuses on only urban and rural communities when collecting data on alcohol consumption patterns. This study focused on peri-urban communities because there are no data available in Ghana that look at alcohol consumption in such communities. Data were collected at the study

locations via face-to-face interviews with consumers who agreed to participate. Interviews were conducted on both weekdays and weekends between 10:00 Hours and 19:00 Hours from October 2010 to February 2011. Three drinking bars were selected, one in each community. These bars were selected because a high volume of people from a wide range of socio-demographic backgrounds patronize them. Bars that were known to be exclusively patronized by high income earners or low income earners were excluded, as well as those with low patronage.

Subjects

After permission was obtained from the management of the drinking bars, trained field assistants visited each bar and interviewed consumers. Participants were approached and asked to participate voluntarily in the survey. If the consumer agreed to participate, informed consent was obtained when the participant was sober and was then asked to answer the questions in the questionnaire. For individuals who were not able to sign their name on the informed consent form, their thumb print was obtained in place of their signature. Following this pattern, a total of 300 participants who were of legal drinking age and willing to participate in the study were screened using modified AUDIT (Alcohol Use Disorders Identification Test) and CAGE (Cut Annoyed Guilty Eye opener) questionnaires [15, 16]. Out of the 300, one hundred and seven (107) alcoholics were identified in the three bars. The data representing all the peri-urban areas were then pooled for analysis.

Ethical consideration

This study was approved by the Institutional Review Board of Noguchi Memorial Institute for Medical Research (NMIMR) of the University of Ghana, Legon.

Socio-demographic and Lifestyle Data

A semi-structured, pre-tested questionnaire was used to obtain relevant data on socio-demographic characteristics and lifestyle practices such as cigarette smoking. Data on physical activity were obtained using the New Zealand Physical Activity Questionnaires [16].

Anthropometric Measurements

World Health Organization (WHO) adult microtoise (UNICEF No. 0114400 DK-2100 Copenhagen, Denmark) was used to measure height to the nearest 0.1 cm; weight was determined using calibrated bathroom scale (Hanson Mechanical Bathroom Scale H400, UK) to the nearest 0.1 kg, biceps and triceps skin fold thickness were measured to the nearest 0.2 mm with a Holtain skinfold-caliper (Holtain Ltd, Crosswell, Crymych, Dyfed, UK), waist and hip circumference was measured using fiber-glass tape measure (Shanghai Kearing Stationery Co., Ltd., Shanghai, China) to the nearest 0.1 cm. All measurements were taken in triplicates with the average of the three readings considered the accepted value. All evaluations were performed on participants in accordance with the reference manual of anthropometric standardization [18].

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Dietary Intake

Dietary intake data were obtained using a 24-hour recall method. Study participants were asked to recall their usual intake during the past 24-hours by reporting amounts, frequency, and methods of preparation of foods consumed with the aid of household food measures. In addition, their predominant types of alcoholic beverage consumed were also reported.

Haemoglobin Concentration

Haemoglobin (Hb) concentration was obtained in the field by use of HemoCue B–hemocue photometer (Haemocue AB, Ängelholm, Sweden) [19]. The accuracy of the instrument was checked daily using control cuvette provided by the manufacturer.

Data Analyses

Statistical Package for the Social Sciences (SPSS) V.16.0 (SPSS Inc., Chicago, IL, USA) was used for statistical analyses. Descriptive statistics were used to summarize socio-demographic and lifestyle characteristics. Data from the 24-hour recall were analyzed with a computerized nutrition database ESHA food processor Version 6.02 (FPRO, Salem, OR, USA). The modified CAGE AND AUDIT questionnaires include questions about the quantity and frequency of alcohol use. The identification of alcoholics, scoring and classification as stipulated from Babor *et al*. [16] and Bush *et al.* [15] were used in the present study.
Amount of ethanol in grams was computed as follows:

$$\text{Amount of ethanol (grams)} = \frac{(\%\ \text{of alcohol} \times \text{volume in ml}) \times \rho}{100}$$

Where $\rho = 0.789$; is the density of pure ethanol [20].

Participants were classified into four (4) levels based on their weekly consumption of ethanol in grams. Analysis of variance (ANOVA) was performed to determine whether there were any significant differences in anthropometry, dietary intake and haematological variables among the four levels. Kruskal-Wallis test was conducted to compare the medians of anthropometric variables and haemoglobin concentrations when the assumption of normality was violated. Binary logistic regression was carried out to determine the predictors of overweight and obesity. A P-value < 0.05 was considered statistically significant**.**

RESULTS

The background and lifestyle characteristics of the 107 respondents who participated in the cross-sectional study are presented in Table 1. Most of the respondents (90.7%) were men with 91.6% of them having at least primary level education. Most of the respondents were employed (85.0%) compared to 15.0% who were unemployed. Among participants of this study, 29.0% reported they were current smokers while 53.3% had never smoked. Mean physical activity duration per week was 3.3 ± 2.8 hours. There was high prevalence of liquor consumption among respondents.

The relationships between ethanol intake and measures of nutritional status are presented in Table 2. The correlation between amount of alcohol consumed and haemoglobin concentration was significant for women (r= 0.729, p= 0.040) but not for men (r= -0.053, p= 0.722). Anthropometric, dietary and haemoglobin characteristics by levels of total ethanol intake are summarized in Table 3. The values for mean biceps skinfold thickness were significantly higher for participants consuming low, moderate and extreme levels of ethanol compared to those with high ethanol intake. Energy intake and haemoglobin did vary significantly across levels of ethanol intake. Table 4 displays the medians and interquartile ranges for anthropometric and haematological variables according to predominant alcoholic beverage consumed by respondents. The median for weight according to predominant alcoholic beverage consumed was significantly different (p= 0.011) with predominant spirit/liquor consumers having the lowest median weight. The differences in the median values among waist circumference (WC), waist to hip ratio (WHR), biceps skinfold thickness, triceps skinfold thickness and haemoglobin concentration were not statistically significant. Significant differences in medians of BMI (p= 0.031) and hip circumference (p= 0.017) for all respondents according to predominant alcoholic beverage were observed. Generally, respondents drinking predominantly beer or mixed alcoholic beverages had higher median anthropometric and haemoglobin measures compared to predominantly liquor consumers.

The binary logistic regression models were adjusted for age, smoking status, physical activity and total energy (Table 5). Ethanol consumption was not a significant predictor of overweight or obesity irrespective of the level of intake among the respondents. Alcoholics classified into moderate level of total ethanol intake had about 3-fold increase in likelihood of overweight or obesity (OR= 2.783, 95% CI= 0.708, 10.938, p= 0.143) whereas for alcoholics who were ex-smokers, the likelihood of obesity decreased by almost 20% (OR= 0.834, 95% CI= 0.258, 2.706, p= 0.762) compared to non-smokers, although these were not statistically significant.

DISCUSSION

The main objective of this study was to determine the association between excess alcohol intake and nutritional status. The role of alcohol in the development of obesity or malnutrition has been the focus of many studies over the last few years, with contrasting results [2, 3, 5]. Similarly, there is no consensus on the relationship between excess alcohol intake and haemoglobin concentration [12, 13, 14].

An earlier study by Moirand *et al.* [13] found that iron stores increased progressively across classes of alcohol intake in alcoholics and heavy drinkers. Even in volunteers drinking small amounts of alcohol compared with teetotalers, there was significant increase in indices of iron stores, such as ferritin [21]. A significant correlation was observed between ethanol concentration and haemoglobin concentration among women, agreeing with the results of Milman and Pedersen [22] who found a positive association in women. However, this study was limited by the small sample size of women. There are several observations which may possibly explain this phenomenon.

Alcohol is known to increase iron absorption by making the intestine more permeable and thus enhancing iron uptake through passive and unregulated transfer [23]. Because most of the women (56%) consumed predominantly mixed alcoholic beverages consisting of beer and wine which are sources of many haematopoetic nutrients notably iron, folate, riboflavin, pantothenic acid, pyridoxine and niacin, it is reasonable for an association to exist between ethanol concentration and blood haemoglobin concentration [24].

Perceived association between alcohol consumption, dietary intake and anthropometry has been the subject of some controlled studies [7, 25]. A focus of this study was to explore the dietary intake of respondents, where it was observed that total energy intake across the four levels of total ethanol intake for alcoholics were below the minimum recommended energy intake for both males and females [26]. This observation confirms the findings of Mannisto *et al.* [10] who reported that increased alcohol consumption is associated with a decrease in total energy intake. Similar results have been reported by Bebb *et al.* [27]. However, they observed that carbohydrate and fat intake decreased with alcohol consumption in their study populations. One possible reason may be that alcohol-derived energy may regulate total dietary intake and ultimately limit energy intake. In Italy there was an increase in energy from non-alcohol sources with increasing alcohol consumption [7]. However, after adjusting for confounders such as age, place of residence, occupation and BMI the authors noted a decrease in energy from non-alcohol sources which is similar to our observation. It has been reported by Manari *et al.* [28] that alcohol may have a dietary regulatory mechanism. They reported in their study that the total energy intake of alcoholics (from alcohol and non-alcohol sources) was apparently adequate with regard to recommended levels. However, further sub-analyses of the dietary intake data of their study sample showed a low intake of one or more macronutrients compared to the dietary reference requirements which was observed in this study.

Most studies on alcohol and nutrition do not focus on socio-economic status. In a study in which social class was considered, it was observed that nutritional deficiencies were rare among middle-class alcoholics; conversely selective nutritional deficiencies were found among low-income and homeless alcoholic populations [29]. The dietary intakes of respondents in this study were below the recommended levels which could be associated with nutritional deficiencies [26].

It is worth mentioning that in spite of several studies done in the area of alcohol and dietary intake, there may be unexplored associations among behavioural factors, alcohol consumption and dietary intake that need to be clarified. For example, examining smoking as a confounder for alcohol and dietary intake in this population especially as the rate of smoking was unexpectedly high compared to what one might expect in the general Ghanaian population. In addition, the ethnic background and inherent difference in dietary habits may play a role in the discordant results on the nutrient intake of alcoholics. Some authors have reported reduced intake of energy, protein and carbohydrates in patients with alcoholic cirrhosis [30]. They observed that

such dietary changes were more pronounced as the severity of the liver disease increased.

The results of this investigation indicated that participants consuming predominantly beer or predominantly mixed alcoholic beverages had significantly higher weight, BMI and hip circumference. The effects of the nutritional content of beer offer a plausible explanation for the apparently higher anthropometric values. This observation is not surprising as about 25% of the starch in fermented beer is in partially degraded and non-fermentable, which could contribute to overall energy count [24]. The finding is also in agreement with McDonald *et al.* [31]; however, they suggested that beer ingestion suppresses the oxidation of fat, favouring fat storage, and can serve as a precursor for fat synthesis. Participants categorized into moderate level of total ethanol intake had greater odds of being overweight or obese. This observation may be attributed to the fact that relatively smaller quantities of ethanol intake stimulate appetite, resulting in higher energy intake compared to larger quantities which inhibit appetite [32].

Limitations

In this study, the presence or absence of potential medical conditions that could probably interfere with dietary intake was not taken into account. Also, the seasonal variations in dietary intakes were not considered. Furthermore, the use of purposive sampling (non-probability sampling) may affect representativeness of the sample chosen and increase the susceptibility to bias, ultimately limiting the generalizability of the study. The self-reporting of quantities of alcohol and dietary intake may also suffer recall bias.

CONCLUSION

From these observations, it may be concluded that the mechanisms for the observation of higher weight, BMI and hip circumference among predominant beer consumers in this population need further exploration.

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I owe special thanks to the respondents who volunteered to respond to questions and undergo the procedures necessary to conduct the survey.

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Table1: Background and lifestyle characteristics of respondents (N= 107)

Variable	n (%)
Sex	
Male	97 (90.7)
Female	10 (9.3)
Age (years)[1]	
≤34	53 (49.5)
35-49	32 (29.9)
50^{+}	22 (20.5)
Educational Level	
None	9 (8.4)
Primary	6 (5.6)
Junior High School	39 (36.5)
Senior High School	30 (28.0)
Tertiary	23 (21.5)
Marital Status	
Married/Cohabiting	59 (55.2)
Single/Never been married	37 (34.6)
Divorced/Separated/Widowed	11 (10.3)
Employment Status	
Employed	91 (85.0)
Unemployed	16 (15.0)
Smoking Status	
Never Smokers	57 (53.3)
Ex-smokers	19 (17.8)
Current smokers	31 (29.0)
Duration of alcohol consumption (years)	
≤10	48 (44.9)
11-20	29 (27.1)
21-30	17 (15.9)
≥31	13 (12.1)
Predominant type of alcoholic beverage consumed	
Beer	14 (13.1)
Spirit/Liquors	55 (51.4)
Mixed	38 (35.5)
Variable	**Mean ± SD**
Duration of alcohol consumption (years)	15.4 ± 11.7
Age alcohol consumption began (years)	23.3 ± 8.6
Duration of physical activity per week (hours)	3.3 ± 2.8

[1]Completed years

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Table 2: Correlation between amount of ethanol intake (g/week) and nutritional status indicators

Study Variable	r ¶	P-value
Weight		
Men (n= 97)	0.053	0.609
Women (n= 10)	-0.459	0.182
All (N= 107)	0.033	0.734
BMI		
Men (n= 97)	-0.087	0.396
Women (n= 10)	-0.419	0.228
All (N= 107)	-0.107	0.274
Biceps skinfold		
Men (n= 97)	-0.100	0.330
Women (n= 10)	-0.482	0.158
All (N= 107)	-0.173	0.075
Triceps skinfold		
Men (n= 97)	-0.165	0.106
Women (n= 10)	-0.413	0.236
All (N= 107)	-0.213	**0.028***
Waist Circumference		
Men (n= 97)	0.038	0.739
Women (n= 10)	-0.387	0.269
All (N= 107)	0.005	0.957
Hip Circumference		
Men (n= 97)	0.124	0.272
Women (n= 10)	-0.435	0.209
All (N= 107)	0.077	0.471
WHR		
Men (n= 97)	-0.105	0.350
Women (n= 10)	-0.247	0.491
All (N= 107)	-0.093	0.189
Hb Concentration		
Men (n= 97)	-0.053	0.722
Women (n= 10)	0.729	**0.040***
All (N= 107)	-0.035	0.801

Hb- Haemoglobin concentration; r- Pearson correlation coefficient; WHR- Waist-to-Hip ratio; ¶- correlation; *Correlation is significant P <0.05 (2 tailed)

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Table 3: Anthropometry, dietary and haemoglobin profile of participants according to level of ethanol intake (N=107)

Study Variable	All (N= 107)	Low (n= 22)	Moderate (n= 27)	High (n= 24)	Extreme (n= 34)	P-value¶
Anthropometry						
BMI (kg/m^2)	23.7 ± 4.0	23.3 ± 3.3	24.7 ± 5.0	22.6 ± 3.0	23.8 ± 4.2	0.276
Biceps (mm)	6.0 ± 3.3	7.2 ± 4.7^a	6.6 ± 3.8^a	4.7 ± 1.4^b	5.6 ± 2.5^a	**0.048***
HC (cm)	96.0 ± 10.9	97.5 ± 7.5^a	95.7 ± 11.0^a	90.2 ± 9.6^b	100.0 ± 12.2^c	**0.015***
WC (cm)	85.8 ± 11.9	86.1 ± 10.2	87.8 ± 15.0	80.0 ± 7.4	88.7 ± 12.2	0.056
Weight (kg)	67.5 ± 11.9	65.8 ± 9.4^a	70.0 ± 15.0^a	61.9 ± 9.3^b	70.4 ± 11.2^a	**0.028***
Triceps (mm)	9.3 ± 4.8	10.9 ± 5.0^a	10.6 ± 6.8^a	7.8 ± 3.4^b	8.2 ± 2.8^b	**0.037***
WHR	0.9 ± 0.1	0.9 ± 0.1	0.9 ± 0.1	0.9 ± 0.1	0.9 ± 0.1	0.372
Dietary Intake						
Total energy (kcal)	1814.4 ± 954.4	1833.0 ± 882.6	1629.0 ± 639.8	1628.0 ± 1006.0	2081.0 ± 1130.0	0.206
Fat (kcal)	45.3 ± 30.0	49.5 ± 30.9	41.1 ± 23.9	40.8 ± 32.8	49.2 ± 32.0	0.560
Protein (kcal)	63.2 ± 37.2	59.9 ± 31.6	62.5 ± 30.7	58.2 ± 40.8	69.6 ± 43.0	0.660
Carbohydrate (kcal)	260.1 ± 160.4	289.0 ± 159.7	224.1 ± 124.9	236.4 ± 166.3	286.8 ± 179.1	0.319
Iron (mg)	11.5 ± 6.6	11.7 ± 6.6	9.6 ± 4.9	10.4 ± 6.9	13.6 ± 7.2	0.088
Hematological						
Haemoglobin (g/dL)	15.3 ± 17.6	12.9 ± 1.5	13.1 ± 2.0	13.4 ± 2.1	12.8 ± 2.0	0.858

All data expressed as mean ± SD

SD- standard deviation; mm- millimetre; cm- centimetre; kg- kilogramme; Hip Circumference- (HC); Waist Circumference- (WC)

Levels of ethanol intake (units is g week^{-1} of pure ethanol) ≤119.5 (low); 119.6-219.6 (moderate); 219.7-319.7 (high) and >319.7 (extreme)

¶One-way ANOVA compares the means of unmatched groups; post-hoc test Tukey's multiple comparison tests

$^{a-c}$Means with different superscripts in a row indicate significant differences ($P < 0.05$)

* Significant at $p < 0.05$ (2 tailed)

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Table 4: Anthropometric variables and haemoglobin levels according to predominant alcoholic beverage consumed

Study Variable	Beer (n= 14)	Spirit/ liquor (n= 55)	Mixed (n= 38)	P-value §
Anthropometry				
Weight, kg	72.5 (64.0, 77.0)[a]	64.0 (57.8, 70.0)[b]	70.0 (61.0, 78.0)[a]	**0.011***
BMI, kg/m^2	23.7 (22.8, 25.7)[a]	21.9 (20.1, 24.6)[b]	23.6 (22.4, 26.7)[a]	**0.031***
Biceps, mm	6.2 (4.2, 7.0)	4.4 (3.6, 6.2)	5.7 (4.2, 8.6)	0.052
Triceps, mm	9.0 (7.2, 12.8)	8.0 (6.0, 11.3)	8.1 (6.0, 11.2)	0.264
WC, cm	89.8 (83.5, 95.0)	81.0 (79.4, 93.5)	84.0 (74.5, 89.8)	0.055
HC, cm	102.0 (94.0, 105.8)[a]	93.0 (85.0, 100.0)[b]	98.0 (91.3, 103.5)[a]	**0.017***
WHR	0.9 (0.8, 0.9)	0.9 (0.8, 0.9)	(0.9) (0.8, 0.9)	0.885
Biochemical				
Haemoglobin, g/dL	14.5 (12.3, 15.0)	12.7 (11.1, 14.0)	14.0 (12.1, 14.7)	0.085

All data expressed as Median (Interquartile range)

BMI- body mass index; WC- waist circumference; HC- hip circumference; WHR- Waist-to-Hip ratio; §- Kruskal-Wallis One Way Analysis of Variance on Ranks was used to compare unpaired groups and post hoc tests with Dunn's multiple comparison to test between-group differences; [a-b] Medians with different superscripts between a column indicate significant differences ($P < 0.05$).

* Significant at $p < 0.05$ (2 tailed)

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Table 5: Adjusted logistic regression showing the association between levels of ethanol consumption and occurrence of overweight and obesity

			95% Confidence Interval		
Variable	**β**	**OR**	**Lower**	**Upper**	**P- value**
Alcohol Levels[1]					
Extreme	0.519	1.681	0.462	6.116	0.431
High	-0.554	0.575	0.125	2.639	0.476
Moderate	1.024	2.783	0.708	10.938	0.143
Low		1.000	Reference		
Energy Levels					
High	1.765	5.844	0.637	5.361	0.118
Moderate	-0.064	0.938	0.336	2.620	0.903
Low		1.000	Reference		
Physical Activity Levels[2]					
Highly active	-1.202	0.301	0.080	1.130	0.075
Relatively active	-0.952	0.386	0.130	1.149	0.087
Relatively inactive		1.000	Reference		
Smoking Status					
Current smoker	-0.715	0.489	0.159	1.506	0.213
Ex-smoker	-0.181	0.834	0.258	2.706	0.762
Never smoker		1.000	Reference		
Age Category					
≥50	0.377	1.457	0.446	4.758	0.533
35-49	-0.162	0.850	0.286	2.531	0.771
20-34		1.000	Reference		

[1]Levels of ethanol intake (units is g week^{-1} of pure ethanol) ≤119.5 (low); 119.6-219.6 (moderate); 219.7-319.7 (high) and >319.7 (extreme)

[2]Levels of physical activity (total time equivalent to moderate activity over last 7 days) <2.5 (relatively inactive); 2.5–4.9 (relatively active); >5 (highly active)

Odds ratio obtained using binary logistic regression controlling for age, smoking status, physical activity and total energy. Hosmer-Lemeshow Statistic: P = 0.979; Nagelkerke R^2= 0.171.

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