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Assessment of nutritional status and level of alcohol dependence of men residents of Gesima village, Nyamira County, Kenya

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Abstract
Background: Excessive alcohol consumption affects nutritional status in two major ways. One it displaces other foods from the diet, two it affects metabolism and utilization of both macro and micro nutrients. Intake of Vitamins A, C and B and minerals such as calcium, iron may be consumed below Required Nutrient Intake (RNI). The main objective of the study was to investigate prevalence of malnutrition and level of alcohol dependence among men residents of Gesima village.
Methods: A cross sectional study was used where 126 households systematic randomly sampled. 254 consenting men aged16-45 years old from the 126 households were recruited into the study and structured questionnaire was administered to them to obtain data. The Alcohol Use Disorder Identification Test (AUDIT) was used to group the men into the various alcohol dependence levels. Anthropometric measurements including Mid Upper Arm Circumference (MUAC), weight, height and Skin Folds were also taken. Food frequency questionnaire was used to ascertain the dietary intake of the respondents. Statistical techniques including the chi-square, t-test and logistic regression were employed in the analysis. All the analysis was done using SPSS V.17.0. $P<0.05$ was considered significant.
Results: Among the study subjects, 118(46.5%) had primary level of education and 210(82.7%) were in informal employment. Their mean age (years) was 29.04(SD 6.7). Slightly more than half 134(52.8%) had a monthly household income of between Kshs 1000-5000. Based on BMI, 210 (82.7%) of the respondents were normal weight for nutrition status. Only 43(17%) were hazardous drinkers.
Conclusion: Findings from this study indicate that marital status significantly influences the level of alcohol dependence whereby the married are more alcohol dependent than the single, separated or widowed and alcohol consumption in turn inversely affects nutritional status. There is need for increased community education on the adverse effects of alcohol at the individual, household and community level so as to reduce alcohol dependence thereby improving the nutritional status of the study population.

Keywords: nutritional status, alcohol dependence

Introduction

Substance abuse particularly alcoholism and associated problems have come under control and are well managed in developed countries that have engaged in substance abuse for a long period of time in contrast to many developing nations. Alcohol consumption is gaining momentum in many developing regions, and early debut of drinking and excessive intake has been reported, information on the usage of banned drugs and alcohol in developing countries is hard to obtain [1].
Whereas drug abuse will cause social disintegration, it is apparent that social deprivation also leads to drug abuse as a way of handling emotional stress, thus perpetuating a vicious cycle. Depression caused by stress, anxiety and boredom also encourages substance abuse as a kind of self-medication. The impact of alcohol dependence on health and on society as a whole is considerable. The burden of disease measured in disability-adjusted life years caused by alcohol consumption in considerable in developing countries accounting for approximately 0.5 to 16 percent. Alcohol abuse is associated with over 60 different types of diseases and injury [1]. Alcoholism is a chronic disorder with its predisposing factors being genetics, mental and environmental factors. The disease is often gradual and can cause death and its symptoms include continuous or regular impaired control over its use, preoccupation with alcohol, continuous consumption of alcohol irrespective of the dangers caused to health and distorted thinking especially leading to denial [2]. Because of its effect on the body, alcohol dependence leads to malnutrition particularly under nutrition, which in turn causes the alcoholics to become weak most of the time leading to reduced work productivity, poor health and poverty in the family and society at large.
Research study held in a hospital in Kenya found that 54 percent of the males and 25 percent of the females in the outpatient section were alcohol dependents [3, 4] found that alcohol dependence as monumental effects on nutritional status, it depresses the appetite, displaces other food nutrients from the diet and decreases the quality of food by hampering proper digestion and absorption. Alcohol hinders proper utilization of nutrients by the body once they have been absorbed, by interfering with their transport, metabolism and storage. Therefore patients with medical complications

associated with alcohol abuse and dependence are usually severely malnourished with signs of protein deficiency. Such medical complications especially liver disease, are mainly attributed exclusively to nutritional deficiency. While severe malnutrition may be relatively rare, the effects of extreme nutritional disturbances become more pronounced as alcohol use increases.

As the quantity of alcohol consumed rises, the amount of energy obtained from protein, fat and carbohydrate declines and the nutritional quality of the diet decreases [5]. Alcohol abuse has been observed to alter dietary intake in a many different ways, depending on the drinking pattern, duration of alcohol use and quantity of consumed. Alcohol consumption directly affects the total energy consumed through its contribution to energy intake, as well it indirectly affects dietary intake especially energy and nutrients by changing the eating behaviour i.e. eating occasions, foods choices and quantity of food consumed [6].

The magnitude of the alcohol related problems vary considerably among as well as within countries. Perceptions of old acceptable patterns, which guide total alcohol intake decisions, also vary among different cultures, as a result, drinking range from intoxication momentarily to regular habitual drinking patterns. The difference in drinking patterns among countries makes it cumbersome to record the problems and conditions in which alcohol is the real factor. In addition physiological differences together with varying drinking patterns make it difficult to gauge how alcohol ideally, contributes to identify alcohol related problems [3]. As economic growth and development improves considerably in many developing regions, an increase in the levels of alcohol use and abuse is expected with resultant increase in alcohol related health challenges [7].

Alcoholism has been referred to as a family disease. An alcoholic's behaviour can cause complete disintegration of a family set up and cause painful moments lasting a lifetime. Alcoholism can also impact negatively on an alcoholic's spouse, who harbour feelings of being hated, making him/her avoid social groupings, may get exhausted with the drinking habit and develop physical or psychological problems. Studies have shown that alcoholic families are aware that family and marital problems often start as a result of alcohol dependence, but they also indicate that spouses and children also play a role in the alcoholic's habit and make it worse. Some families encourage heavy drinking instead of dealing with serious family problems associated with it in the hope of keeping the family together [8].

No country is free from problems caused by alcohol abuse. A broad segment of the world community has demonstrated great concern about the problems caused by alcoholism. Studies have clearly shown that, the prevalence of alcohol consumption and substance abuse in adults in Kenya is considerably expanding to the detriment of the society. It has been realized that a good proportion of Kenyans are under siege from alcohol and drug abuse. Therefore Kenyans cannot afford to be complacent about this looming problem that needs immediate attention.

According to Madegwa [9] drugs and substance abuse especially alcoholism is not only a global threat but a national disaster calling for urgent collaborative plan of action. Drug trafficking and abuse is now a major challenge to the youth and administrative service delivery and a major cause of concern in Kisii. Emerging trends in drug trafficking and abuse indicates that Kisii region is increasingly becoming not only a transit route but a destination. It is also increasingly becoming a major corruption indicator in Kisii. Drugs not only affect the individual and his immediate family but the community and the county as a whole.

According to Nyamira District Development Plan [10], drug and alcohol abuse is one of the many challenges facing the district that need to be addressed urgently. The problem of drug abuse especially alcoholism is prevalent in Gesima village which also happens to harbor many drinking dens visited by individuals from both within and outside the village. Most of the alcohol abusers who visit these dens are mostly men who are in their productive age bracket. The local administration led by the village elders noted that one of the challenges in this area is the increased alcohol abuse which affects very young men in their prime age. It is with this in mind that the study purposed to investigate the magnitude and determinants of malnutrition and level of alcohol dependence among men living in Gesima village with the aim of providing appropriate information for intervention.

Materials and Methods

Study area

This study was carried out in Gesima village Nyamira County. The village is predominantly occupied by the Kisii community, and has a hilly topography lying at altitude 1800m above the sea level and with a population density of about 731 persons per square kilometer. The village covers slightly less than 2km square, and therefore has a population projected at 1200 persons (National Coordinating Agency for Population and Development, 2005) [11]. The village is served by one mission dispensary within the village and two others that are slightly outside the village, one of which is a government dispensary. According to the National Coordinating Agency for Population and Development [11], health facilities in the district require rehabilitation, staffing and equipping.

The village and district as a whole produce a variety of food crops such as maize, beans sorghum and finger millet. Food production is enough and can sustain the needs of the population. The food is generally affordable and accessible given the fairly distributed income amongst the households.

The main problems in the district include: poor development planning; deforestation resulting in soil erosion and pollution of water sources; high unemployment and increased school dropouts, early marriages and pregnancies; drug and alcohol abuse among other challenges [11].

Study design

Kothari [12] defines a research design as one which provides for the collection of relevant evidence with minimal expenditure of effort, time and money. This study employed a cross sectional descriptive study design. That is, the study was carried out at a point in time. A descriptive study is concerned with determining the frequency with which something occurs or the relationship between variables.

Sampling size and sampling procedure

i) Sample size determination

The sample size was determined using the Yamane formula for finite population [13] as follows;

$$n = \frac{N}{[(1 + N(e)^2]}$$

Where n = sample, N = population size (185) and e = accepted level of error taking alpha as 0.05.
By substitution in the formula, we have sample size as;

$$n = \frac{185}{\{1+185(0.05)^2\}}$$

Thus a minimum of 126households participated in the present study. A total of 254 consenting respondents aged 16 to 45 years from the 126 households were recruited and therefore participated in the study.

ii) Sampling procedures
Systematic random sampling method was employed to obtain a representative sample of the study population. The total number of households in the village was 185 every 2nd household was picked to participate in the study. This was arrived at by dividing the total number of households 185 by the sample size 126. In each of the selected households, all men aged 16-45 years and consenting were included in the study. The village has two ends and the part to start from was identified by tossing a coin. The first household was picked randomly from the first two and every 2nd household was then picked in that order.

Data collection instruments
Data was collected using a semi-structured questionnaire. The questionnaires were used because they allow the respondents to give their responses in a free environment and help the researcher get information without coercion and questionnaires are less expensive.

Data collection procedure
Data was collected from the respondents through interviews, anthropometric measurements and dietary assessment using food frequency questionnaire.

i) Anthropometric measurements
Data was collected, by taking, anthropometric measurements of Body Mass Index (BMI), Mid Upper Arm Circumference (MUAC) and also by taking the Skin Fold measurements of the male study population.
Body mass index (BMI) was calculated from each respondent's weight and height according to the following equation:

BMI = weight (kg)/height (m) [2]

WHO/FAO classification was used to define underweight, normal weight, overweight (also called pre-obesity), and obesity classes measured as follows: Below 18.5-underweight, 18.5-24.9 normal weight, 25-29.9 over weight and 30 and above obese.
Weight for adults was taken with the adults standing on the adult weighing scale with subjects having light clothing with no shoes. The measurements were recorded in Kilograms to the nearest 0.1 kilograms. The weighing equipment was calibrated every morning before use.
Heights of the subjects were measured using adult height measurement board, and the measurements were taken in metres to the nearest 0.1 masseters. The subjects were made to stand straight looking straight ahead with Frankfurt plane horizontal, shoulders relaxed, arms at sides, legs straight and knees together, feet flat with heels almost together and shoulder blades, buttocks and heels touching measuring board.
Age was determined by checking the date of birth from the national identity cards and where the cards were not available; the calendar of events was used and ages recorded in years and others were asked and trusted to have given the correct age.
An insertion tape was used for MUAC. This is a calibrated tape that has a slit where you insert as you measure. The slit corresponds to the 0 mark on insertion thereby giving actual measurements. This measurement was taken at the mid of the left arm midway between acromion process of the shoulder and olecranon process of the elbow. The palm was placed on the stomach to relax the arm and the arm was at right angle to the body. The mid was marked then circumference taken with the arm falling loosely at the side of the body. The readings were recorded in centimeters to the nearest 0.1cm. Triplicate readings were taken for each of the measurements and their means recorded to reduce random errors.
Skin fold thickness measurements are said to provide an estimate of the size of subcutaneous fat depot, which in turn provides an estimate of the total body fat. The following sites are commonly used and were used in the study:
Triceps skin fold- measured at the mid-point of the back of the upper left arm. Biceps skin fold- measured as the thickness of a vertical fold of the front of the upper left arm, directly above the center of the cubital fossa, at the same level as the triceps skin fold.
Subscapular skin fold- measured just below and laterally to the angle of the left shoulder blade, with the shoulder and the left arm relaxed. Placing the subject's arm behind the back may assist in the identification of the site. Skin fold is grasped at the marked site with the fingers on top, thumb below and finger on the site at the lower tip of the scapular. The skin fold should angle 45^0 from horizontal, in the same direction as the inner border of the scapula (i.e. medially upward, and laterally downward).
Suprailiac skin fold- measured in the midaxillary line immediately superior to the iliac crest. The skin fold is picked up obliquely just posterior to the midaxillary line and parallel to the cleavage lines of the skin, or the skin is picked up horizontally on the midaxillary line, at the level of the xiphoid process.
Skin fold thickness measurements are best made using precision skin fold thickness calipers which were used in this study; they measure the compressed double fold of the fat plus skin, and were first measured once and the circuit was then repeated two more times. The mean value of each site was then used as the skin fold result.

Percentage body fat was computed from the skinfold measurements using a two-step formula. First, body density (D) was calculated using formula developed by Durnin and Womersley, secondly body density (D) was substituted in Siri Equation to obtain percentage body fat. Computing body density (D) involves using skinfold measurements from four areas of the body i.e. biceps, triceps, suprailiac and subscapular, the log (L) of the sum of these skinfold measurements is then substituted into one of the following equations to calculate the density (D).

Age (years)	Equations for Males	Equations for Females
< 17	D = 1.1533 - (0.0643 X L)	D = 1.1369 - (0.0598 X L)
17-19	D = 1.1620 - (0.0630 X L)	D = 1.1549 - (0.0678 X L)
20-29	D = 1.1631 - (0.0632 X L)	D = 1.1599 - (0.0717 X L)
30-39	D = 1.1422 - (0.0544 X L)	D = 1.1423 - (0.0632 X L)
40 -49	D = 1.1620 - (0.0700 X L)	D = 1.1333 - (0.0612 X L)
> 50	D = 1.1715 - (0.0779 X L)	D = 1.1339 - (0.0645 X L)

(Durnin & Womersley, 1974) [14].

Percentage body fat is then calculated by substituting density (D) in the Siri (1961) equation as shown below.

$$\% \text{ Body Fat} = \frac{(4.95-4.5) \times 100}{\text{Density (D)}}$$ [15]

(Bale, 1980)

ii) Dietary assessment

A semi-quantitative food frequency questionnaire with a list of 70 foods was administered. Frequency was coded as daily, weekly, monthly, yearly or never, and the numbers of predefined measuring units consumed were recorded. A measuring unit, approximated by assistants served as a reference portion from which the enumerator determined the amount that the respondent stated he consumed, according to the frequency of intake specified. Portions were also recorded in grams, as required for foods that were recorded by weight. A pilot study was conducted to validate this method and test the feasibility of the study. A bag containing household equipment such as a kitchen scale, measuring cups and spoons were used to help respondents recall the quantity of foods eaten.

iii) Estimation of a standard alcohol drink

According to Australian Standard Drink (2012) [16] a standard drink that contains 10 grams of alcohol. A standard drink has the same amount of alcohol irrespective of the size of the container used or type of alcohol type, whether beer, wine, or spirit. A standard drink is a unit of measurement. As a kilometer measures the distance one has travelled, so does a standard drink measure quantity of alcohol consumed. The following formula was used to calculate the number of standard drinks in alcohol consumed:

Amount of drink in litres (Vol) x Percent by volume of alcohol (%) x Density of ethanol (ethyl alcohol) at room temperature (0.789)

Example:
500ml of beer which is 5 percent alcohol by volume.

$$0.5 \times 5 \times 0.789 = 1.97 \text{ (approx 2 standard drinks)}$$

A study conducted in Eldoret Kenya indicates that the average ethanol or pure alcohol content in changaa was 34% and 4% for busaa [17]. These figures were used in this study to estimate the amount of alcohol consumed in the village given that the Kenyan government has not come up with its standard.
Pure alcohol estimation was done using the following alcohol percentages: 5% for beer, 12% for wine and 40% for spirits [18].

Data management and statistical analysis

Completed questionnaires were coded and then entered in statistical computer package SPSS version 17.0. The nutrient calculator computer program was used to determine the mean daily nutrient intake from the food frequency data. The probability approach was used to estimate the proportion of the population (%PINI) at risk of having inadequate intake of the selected nutrients. The nutrient intakes are classified into six classes as individual's intake in terms of percent estimated average requirement (EAR) for groups [19]. The number of individuals with intakes of the nutrient within each class was determined. This number was then multiplied by the appropriate probability for each class to give the number of individuals per class who are likely to have intakes below their own EAR. The sum of this numbers was divided by the sample size to give the proportion of individuals in the population who were at risk of having inadequate intake of the selected nutrients.
Data was summarized using Frequencies, means and standard deviations. Chi square tests, was used to establish relationships between categorical variables and the study outcomes (underweight and alcohol dependence). One sample t- test was used to compare mean daily nutrient intake against EAR. Logistic regression was used to identify significant predictors of under-nutrition and alcohol dependence controlling for confounders. In all cases, $p < 0.05$ was used as the cut-off for statistical significance.

Results

Socio-demographic and economic characteristics

As in Table 1 majority of the respondents 111(43.7%) were aged 26-35 years and 172(67.7%) were married. Majority of the respondents 118(46.5%) had attained primary level of education and 210(82.7%) were in informal employment. Slightly more than half 134(52.8%) had an average monthly household income of between Kshs 1001-5000 per month.

Table 1: Socio-demographic and economic characteristics of respondents

Characteristic		Frequency (%)
Age (years)	16-25	84(33.1)
	26-35	111(43.7)
	36-45	59(23.2)
Marital status	Single	78(30.7)
	Married	172(67.7)
	Separated	2(0.8)
	Widowed	2(0.8)
Level of education	Primary	118(46.5)
	Secondary	106(41.7)
	Tertiary	30(11.8)
Employment status	Formal	24(9.4)
	Informal	210(82.7)
	Unemployed	20(7.9)
Average monthly income (Kshs)	None	20(7.9)
	≤1000	52(20.5)
	1001-5000	134(52.8)
	5001-10000	18(7.1)
	10001-20000	23(9.0)
	>20000	7(2.7)

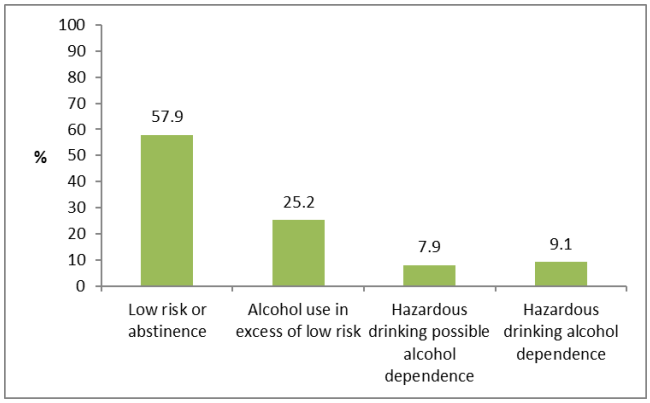

Fig 1: Distribution of respondents by level of alcohol dependence

Fig 2: Distribution of respondents by level of alcohol dependence
More than half of the respondents 147(57.9%) were low risk or abstinence alcohol dependents while 43(17%) were hazardous drinkers.
Figure Distribution of body composition (Based on BMI)

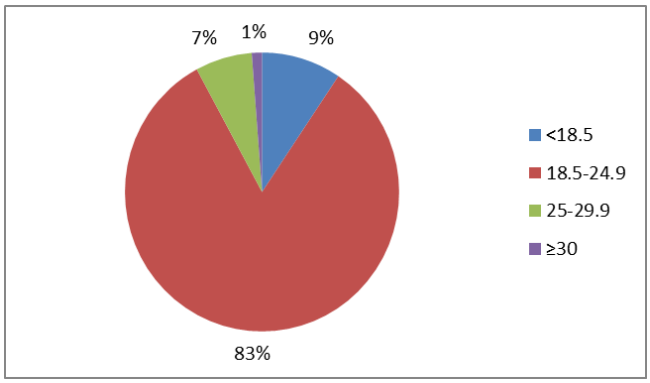

Fig 2: Respondents distribution of body composition based on the BMI (<18.5)

Figure 3 shows the body composition of the respondents measured using Body Mass Index (BMI). Majority of the respondents 210(82.7%) were classified as normal weight (18.5-24.9) while 24(9.4%) as underweight (<18.5 BMI) and 7.9% were overweight and obese.

Table 2: Respondents' Body composition and level of alcohol dependence

Body composition	Level of alcohol dependence	Mean±SD	F-value	p-value
BMI	Abstinence or low risk drinking	22.08±2.7	40.503	<0.001
	Alcohol use in excess of low risk	21.6±1.5		
	Hazardous drinking possible alcohol dependence	18.7±0.9		
	Hazardous drinking alcohol dependence	17.5±1.4		
MUAC	Abstinence or low risk drinking	27.1±2.1	36.723	<0.001
	Alcohol use in excess of low risk	26.9±2.1		
	Hazardous drinking possible alcohol dependence	24.4±1.9		
	Hazardous drinking alcohol dependence	23.0±1.3		
%BF	Abstinence or low risk drinking	20.4±4.2	5.211	<0.002
	Alcohol use in excess of low risk	18.9±2.9		
	Hazardous drinking possible alcohol dependence	18.1±1.4		
	Hazardous drinking alcohol dependence	16.5±2.2		

Table 2 indicates the association between level of alcohol dependence and body composition measured using Body Mass Index (BMI), percentage body fat (%BF) and Mid Upper Arm Circumference (MUAC). The F-test (ANOVA) indicated that there was a significant difference in mean BMI (F= 40.503; p<0.001), MUAC (F=36.723; p<0.001) and %BF (F= 5.211; p=0.002) by level of alcohol dependence. The mean levels decreased with an increase in level of alcohol dependence though post-hoc analysis indicated that there was no significant difference in mean BMI, %BF and MUAC between low risk or abstinence and alcohol use in excess of low risk and also between Hazardous drinking possible alcohol dependence and Hazardous drinking alcohol dependence (all p>0.05).

Discussion

Demographic and socio-economic characteristics

The study shows that the level of education of the respondents is low with the majority of the men having attained a maximum of primary level of education with a small number with tertiary level of education. This can be attributed to poverty and lack of information to appreciate the value of education given that majority of the respondents 134(52.8%) earn an average of kshs 1001-5000 per month which is quite little to support studies to the higher levels where a lot more

money is needed to pay for better education. This also explains why majority of the respondents are in informal employment 82.7% since they cannot secure any formal job given their low level of education.

Majority of the respondents were married 67.7% and only a few were single, separated or widowed. Income levels are low with majority of the respondents 134(52.8%) earning Kshs 1001-5000.

Nutritional status characteristics

In this study Body Mass Index (BMI), percentage body fat (%BF) and Mid Upper Arm Circumference were used to compute the nutritional status of the respondents. Using BMI 82.7% of the respondents were of normal weight, as opposed to 9.4% underweight and 7.9% over weight and obese. The high percentage of the respondents with normal weight is as a result of the availability and consumption of Proteins and Carbohydrates which are in adequate supply as the study found out. This can be attributed to agricultural productivity of this region which has adequate rainfall patterns throughout the year and therefore people are able to access adequate food especially proteins and carbohydrates from the food grown locally.

The level of alcohol dependence significantly negatively impacts on the nutritional status as the study indicates. Poor nutritional status can result from long term alcohol use and abuse. Long term heavy drinkers eventually fail to eat adequate amounts of food and this prevents them from obtaining the necessary nutrients like vitamins and also minerals for proper maintenance health and general well-being. In addition digestion of nutrients is affected when a person consumes large quantities of alcohol as it reduces the amount of pancreatic digestive enzymes secreted. Absorption of nutrients into the bloodstream is also hindered by alcoholism. This reduced digestion and absorption of nutrients over a long period of time leads to malnutrition (Nutrition and well-being A to Z, n.d.).

This study is in agreement with Liangpunsakul (2010) [19] who found that alcohol intake has an inverse relationship with body mass index and body weight. Carbohydrate intake is usually the first to decrease with increasing alcohol use among all the macronutrients. The level of alcohol dependence is therefore associated with lower consumption of macronutrients.

Respondent's extent of alcohol dependence

Majority of the respondents 57.9% had abstinence or low risk level of alcohol dependence therefore majority of the respondents were either abstainers or consumed very small amount of alcohol with low risk level of alcohol dependence. The study found that the level of alcohol dependence is significantly determined by marital status whereby the married were more likely to be alcohol dependent than the single, separated and/or widowed. Other factors such as age, level of education and income level were not significant determinants of the level of alcohol dependence. This study is in agreement with a study done in Central province Kenya that found that marital status and poverty are some of the key factors that lead people to indulge in alcohol consumption and alcoholism [20]. Most married people indulge in alcohol use and alcoholism because of family problems and conflicts which would be as a result of poverty and/or other factors.

Van and colleagues [21] found out that abstinence was significantly inversely associated with educational level. Men involved in excessive drinking, and notably very excessive alcohol consumption, were predominantly in the lowest level of education. This means that the lower the level of education the higher the level of alcohol dependence. This contravenes this study which indicates that there is no association between the level of education attained and level of alcohol dependence. This can be attributed to the concentration of respondents at the lowest level of primary education.

Simiyu, Neyole and Mutsotso [22] also found that alcohol consumption is a significant predictor of morbidity, mortality and poverty. This is in agreement with this study which found a significantly positive association between sickness three months prior to the study and the level of alcohol dependence. This means that the higher the level of alcohol dependence the more likely that the respondents had fallen sick three months prior to the study.

Conclusion

Results from this study give a clear picture of the distribution of alcohol dependence, nutritional status, adequacy of nutrients consumed and factors that affect level of alcohol dependence and nutritional status among the men aged 16 to 45 years residents of Gesima village.

The study has revealed that the prevalence of over nutrition and under nutrition were very low. This is attributed to the available of food that is grown locally given that the village is found in an area that is agriculturally productive within adequate rainfall distributed throughout the year. Also given that most respondents are in informal employment then it means that they are active in physical work hence overweight and obese cases are rare.

Most respondents were classified within the abstinence or low risk level of alcohol dependence however a significant proportion were also hazardous drinkers which clearly should be a major concern. Most of the nutrients were in adequate supply as shown in this study. However folate, zinc and Vitamin B_2 were in inadequate supply and therefore should be of major concern.

The study also shows that the level of alcohol dependence has an inverse effect on the nutritional status with increase in alcohol dependence leading to decrease in nutritional status and vice versa. Therefore the inverse relationship is as a result of alcohol decreasing the value of food consumed through its interference with digestion and absorption.

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