Socio-economic Determinants, Behavioural Risk Factors for Cardiovascular Diseases and Nutritional Anthropometry of Students of Public Tertiary Institutions in Abeokuta, Ogun State, Nigeria.

Akinbule Oluwafunke[1*], Ayoola Ayotunde[1], Oladoyinbo Catherine[1], Omidiran Adebukola[2]and Omonhinmin Imoetin[1]

[1]*Department of Nutrition and Dietetics,* [2]*Department of Food Science and Technology, Federal University of Agriculture Abeokuta, PMB 2240*

Corresponding author*: olufunkeakinbule@gmail.com; opeyemiegr8king@gmail.com

ABSTRACT

Background: *Cardiovascular disease (CVD) risk is becoming common among younger age-groups and both socio-economic and behavioural risk factors play major role in CVDs development.*

Objective: *To assess socio-economic determinant, behavioural risk factors for CVDs and nutritional anthropometry of students in public tertiary institutions in Abeokuta.*

Methods: *A cross-sectional study was conducted on 350 respondents using stratified random sampling. Data on socio-economic and behavioural risk factors (smoking, alcohol consumption and physical activity status) were collected using a semi-structured questionnaire. Dietary habit was assessed using a validated adapted questionnaire, nutritional anthropometry (body weight, height, waist and hip circumferences) were measured using standard procedures. Data were analysed for descriptive statistics. Chi-square and Pearson's correlation were used to test for association among variables using statistical package for social science, version 20.*

Results: *Only 4.9% respondents smoke, 40.9% consume alcohol, 65.5% engage in physical activity 90.3% skipped meal, 65.9% consumed carbonated beverages (CB) for >2 days/week, 28.6% snacked on fried and sweet foods for >2 days/week, 64.5% consumed fried foods for >2 days/week. Underweight and overweight were more prevalent in females (16.1% and 16.4%) than male (6.1% and 13.7%), while obesity was more prevalent in males (9.2%) than females (5.9%). Estimated monthly income was associated with dietary habit, consumption of CB and alcohol were associated with BMI, smoking and dietary habit were associated with abdominal obesity (AO).*

Conclusion:*Socio-economic and behavioural risk factors significantly contribute to overweight and obesity which are risk factors for CVDs and other non-communicable diseases.*

Keywords: Diet, Lifestyle, Socio-Economic, Obesity

Introduction

Diet related non-communicable chronic diseases are the single largest contributor to global deaths compared to other causes which is anticipated to continue to dominate mortality trends in the future [1, 2]. Major NCDs accounted for about 60% deaths and 43% morbidity globally. In 2016, cardiovascular diseases (CVDs) accounted for 31% global death and more than three-quarter of which occurred in developing countries [1].

The risk factors for developing cardiovascular diseases include: age, gender, unhealthy diet, smoking, alcohol consumption, physical inactivity, obesity (particularly abdominal

obesity), and genetics among others [3, 4]. However, many of these risk factors are modifiable i.e. they can be prevented or delayed by behavioural changes favouring a healthy diet and lifestyle. The rise in cardiovascular diseases is largely driven by these modifiable risk factors. Studies have revealed association between unhealthy diet and increased prevalence of cardiovascular diseases [5,6,7]. The nutrition transition experienced by many developing countries has greatly influenced their diet making, as a result, many developing countries population now consume diet high saturated fat, cholesterol, sodium, simple sugar and low in fruits and vegetable, which have been associated with overweight and obesity. These unhealthy dietary practices areaccompanied by reduced physical activity, the combination of which may lead to increased body weight and hence predispose consumers to diet related non-communicable diseases [8,9].

In addition, alcohol consumption and tobacco use have greatly increased, especially among Nigerian adolescents and young adults. Most of them, especially students in tertiary institutions now consume alcohol and smoke frequently to keep themselves active, especially during examination period. The prevalence of pure alcohol consumption among Nigerian males is 12% with the consumption of about 10.1 liters of pure alcohol per person per year [7]. The prevalence of smoking any tobacco product among Nigerian men is 10% [7]. The world health organisation projects 10% reduction in alcohol consumption, 30% relative reduction in prevalence of current tobacco use, 10% relative reduction in prevalence of insufficient physical activity and halt the rise in obesity as part of the global targets for reduction and prevention of non-communicable diseases by 2025 [7, 8]. This suggests that smokers and high alcohol consumers may be at risk of cardiovascular diseases.Smoking was reported to be the second leading cause for cardiovascular mortality and a major risk factor for cardiovascular diseases [9, 10, 11].Findings from previous studies have shown that CVDs results from interrelationship between multiple factors such as: genetic, socio-demographic and economic factors [12, 13]. Efforts to tackle the problem of NCDs should involve combination of these factors.

Nutritional anthropometry has been shown to be strong predictors for development of cardiovascular diseases. Overweight, Obesity and particularly abdominal obesity have been strongly implicated in the development of cardiovascular diseases [14, 15]. Body mass index is one of the strong predictors of overweight and general obesity [16, 17]. However, waist-hip ratio (WHR) and waist circumference, predict the risk of serious adverse metabolic outcomes better than body mass index (BMI) [18]. Among the indices for assessing central obesity, WHRmeasures body fat distribution [19], because it integrates the adverse metabolic risk associated with increasing waist circumference with the more protective role of gluteal fat deposition [15, 20]. However, WHR may over or under-estimate risk in tall and short individuals with similar waist circumference. Another finding suggests waist-to-height ratio as a suitable index for assessing abdominal obesity, even in tall and short individuals with similar waist circumference [21, 22]. This was based on the argument that, waist and hip circumferences decreases with weight reduction and hence may give inappropriate ratios with reduction in weight of individuals [23, 24].Several studies revealed that abdominal obesity have a superior role over BMI in predicting mortality and cardiovascular disease risks [22, 23]. Although, the WHO still recommends BMI as the universal criterion for determining obesity, with the additional use of waist circumference and waist-to-hip ratio [25]. Basically, efforts to prevent cardiovascular diseases should address all the various factors associated with it.

The risk of CVDs is becoming common, even among adolescents and young adults. Studies on the risk factors for cardiovascular conducted in this region are focused on adults, as such there is little information on the prevalence of the risk factors, particularly behavioural risk factors for developing cardiovascular diseases among adolescents and young adults in this region. Such information will promote the healthy dietary choices, increased physical activity, reduced alcohol consumption, as well as other behavioural factors that can be modified to prevent or reduce the prevalence of cardiovascular diseases, as well as mortality resulting from cardiovascular diseases among this population group. This study therefore assessed the socio-economic determinants, behavioural risk factors for cardiovascular diseases and nutritional anthropometry of adolescents and young adults attending public

tertiary institutions.

Materials and Methods

A descriptive and cross-sectional study was carried out among 350 students in three public tertiary institutions (Federal University of Agriculture, Abeokuta; Moshood Abiola Polytechnic; and Federal College of Education, Osiele) in Abeokuta using a stratified random sampling technique. Data on personal and socio-economic characteristics and some behavioural risk factors (smoking, alcohol consumption and physical activity status) of respondents were collected using a structured questionnaire. Dietary habit was assessed using a validated dietary habit questionnaire, scored and classified as poor ($\leq$54%), fair (55-69%), good (70-84%), excellent (85 – 100%) dietary habit while nutritional anthropometry: body weight, height, waist and hip circumferences were measured using standard procedures. Body mass index (BMI), waist-to-hip (WHR) and waist-to-height ratios (WHtR) were calculated as weight (kg) divided by height square (m), waist circumference (cm) divided by hip circumference (cm) and waist circumference (cm) divided by height (cm) respectively. BMI-for-age of respondents below twenty years of age was analysed using WHO anthroplus. Data was analysed for descriptive statistics. Chi-square and Pearson's correlation analysis was used to test for association among variables.

Informed consents: Respondents' consent was sought before data collection and respondents' information were kept confidential and used strictly for research purpose.

Ethical approval: Ethicalapproval for the study was obtained from the Institutional Review Board of the College of Food Science and Human Ecology, Federal University of Agriculture, Abeokuta.

Results

Bio-data and Socio-Economic Characteristics of the respondents

Table 1 shows the bio-data and the socio-economic status of undergraduates in tertiary institution in Abeokuta. Most (62.9%) of the respondents were female and within the age-range of 20-24 years. About 44.9% were students of Moshood Abiola Polytechnic Abeokuta, 38% were students of Federal University of Agriculture, Abeokuta while 17.1% were students of Federal College of Education, Abeokuta. About half (48.9%) of the respondents' fathers were public servants while 44.9% of their mothers were teachers, 38% fathers and 29.4% mothers completed secondary education while 42% fathers and 32.9% mothers completed tertiary education. In addition, majority (76.6%) of the undergraduates got finances from their parent with majority (90.3%) of the parents earning above the minimum wage monthly.

Table 1: Bio-data and Socio-Economic Characteristics of the Undergraduates

Variables	F	%	Variables	F	%
Sex			**Marital status**		
Female	219	62.6	Single	323	92.3
Male	131	37.4	Married	27	7.7
Age range			**Institution**		
15-19 years	38	10.9	FUNAAB	133	38
20-24 years	230	65.7	FCE	60	17.1
25-29 years	80	22.9	MAPOLY	157	44.9
Father's educational level			**Father's occupation**		
No formal education	6	1.8	Trading	66	18.9
Primary education	57	16.3	Farming	19	5.4
Secondary education	143	40	Public servant	171	48.9
Tertiary education	147	42	Artisan	54	15.4
			Jobless	40	11.5
Mother's educational level			**Mother's occupation**		
No formal education			Trading	157	44.9
Primary education	8	2.3	Teaching	68	19.4
Secondary education	96	27.4	public service	101	28.9
Tertiaryeducation	131	37.4	Full housewife	15	4.3
	115	32.9	Others	9	2.6
Major income source					
Self			**Father's estimated**		
Parent	49	14	**monthly income**		
Spouse	268	76.6	<₦20000	34	9.7
Others	32	9.1	₦ 20,000- ₦ 50,000	89	25.4
	1	0.3	₦ 50,001- ₦ 100,000	82	23.4
Estimated monthly stipend			>=₦ 100,000	145	41.4
<₦5000					
₦ 5,000- ₦ 10,000			**Mother's estimated**		
₦ 10,001- ₦ 20,000	59	16.9	**monthly income**		
>=₦ 20,000	141	40.3	<₦20000	34	9.7
Total	111	31.7	₦ 20,000- ₦ 50,000	113	32.3
	39	11.2	₦ 51,001- ₦ 100,000	88	25.1
			>=₦ 100,000	115	32.9

***FUNAAB-** Federal University of Agriculture, Abeokuta, ***FCE-** Federal College of Education, Osiele, **MAPOLY**-Moshood Abiola Polytechnic, Abeokuta

Behavioural risk factors for cardiovascular diseasesamong respondents

Table 2 shows the behavioural risk factors for cardiovascular diseases among respondents. Majority (95.1%) of the respondents did not smoke but 40.9% drinks alcohol. Among the smokers, almosthalf(47.1%) smokes two sticks of cigarette per day and a quarter smokes three sticks of cigarette per day. Also, among the alcohol drinkers, about 18.3% drink alcohol at least three times/day and 15.2% drink at least three bottles of alcohol/day. About 65.1% engaged in physical activity with 70.2% of them engaging in physical activity for at least 30 minutes a day. Also, only 3.1% and 12.9% had excellent and good dietary habit.About 68.8% respondents skipped meal for at least 3 days/week with 11.1% skipping breakfast. Snacking was also prevalent among respondents with 28.6% snacked on sweet foods and 68.6% snacked on carbohydrate-based meal for at least 3 days/week. In addition, about 74.5% consumes fast food for at least 3 days/week.

Table 2: Behavioural risk factors for cardiovascular diseases among respondents (n=350)

Variables	F	%	Variables	F	%
Smoking status			**Frequency of consum ing carbonated beverages**		
Current Smokers					
Non-smokers	17	4.9	None	35	10.0
	333	95.1	1-2 days	84	24.0
Frequency of smoking			3-4 days	153	43.7
Once	7	2	5-7 days	78	22.3
Twice	10	2.9			
Never	333	95.2	**Frequency of Fast food consumption**		
Number of sticks of cigarette smoked per day (n=17)			None	37	10.6
			1-2 days	87	24.9
			3-4 days	173	49.4
One	5	29.4	5-7 days	53	15.1
Two	8	47.1			
Three	4	23.5	**Frequency of snacking on fried and sweet foods**		
Alcohol consumption status	143	40.9	None	31	8.9
			1-2 days	219	62.6
Current consumers	207	59.1	3-4 days	79	22.6
Non-consumers			5-7 days	21	6.0
Type of alcohol (n=350)			**Frequency of snacking on carbohydrate-based meal**		
None	207	59.1			
Beer	50	14.3	None	17	4.9
Alcoholic wine	34	9.7	1-2 days	93	26.6
Spirit	4	1.2	3-4 days	112	32.0
Herbal mixtures	56	15.7	5-7 days	128	36.6
Dietary habit score			**Frequency of alcohol intake per day (n=143)**		
Poor	53	15.1			
Fair	241	68.9	Once	60	41.9
Good	45	12.9	Twice	19	13.3
Excellent	11	3.1	Thrice or more	64	44.8
Meal skipping (n=350)			**Bottles of alcohol consumed per day (n=350)**	207	59.1
Yes	316	90.3		60	17.2
No	34	9.7	None	29	8.3
			One	54	15.4
Frequency of Meal skipping	34	9.7	Two		
			Three or more		
Not at all	75	21.4		228	65.1
1-2 days	83	23.7	**Do you Exercise?**	122	34.8
3-4 days	158	45.1	Yes		
5-7 days			No		
	39	11.1		68	29.8
Frequency of eating breakfast	116	33.1	**Duration of exercise per day (n=288)**	68	29.8
	73	20.9		66	29.0
None	122	34.9	<30 minutes	26	11.4
1-2 days			30 minutes		
3-4 days			60 minutes		
5-7 days			>60 minutes		

Nutritional anthropometry of the respondents

Table 3 shows the nutritional anthropometry of the respondents. The median weight of respondents were 60.30kg (Male) and 57.20kg (female), median height was 160.00cm (male) and 163.00cm (female), median BMI was 22.94kg/m^2 (male) and 22.07 kg/m^2 (female), median waist circumference was 76.00cm (male) and 74.00cm (female), median hip circumference was 86.20cm (male) and 88.10cm (female), median waist to hip ratio was 0.87 (male) and (0.85) while the median waist to height ratio was 0.40 (male) and 0.45 (female). About 6.1% and 16.1% of the male and female respondents were underweight, 13.7% and 16.4% respondents were overweight while 9.2% and 5.9% respondents had general obesity. Also, 1.5% and 14.3% male and female respondents had high waist circumference, while 1.5% and 10.0% male and female respondents had very high waist circumference. The prevalence of abdominal obesity was 27.5% and 26.9% among the male and female respondents.About 69.4% females were at increased disease risk, 9.9% males and 12.7% females were at high disease risk and only 1.0% female had extremely high disease risk.

Association of socio-economic characteristics and behavioural risk factors for cardiovascular diseases.

Table 4 shows the association between socio-economic and behavioural risk factors for cardiovascular diseases among respondents. Gender and marital status had significant association with alcohol drinking status(p=0.00; 0.00). Age had significant association with consumption of carbonated beverages (CBs) (p=0.00), alcohol consumption status (p=0.00), physical activity (p=0.04) and dietary habit score (p=0.00). Father and mother's educational level had significant association with respondents' consumption of CBs, (p=0.03, 0.00), alcohol consumption status (p=0.00, 0.02) and dietary habit (p=0.03, 0.00). Also, father and mother's estimated monthly income had significant association with respondent's alcohol consumption status (p=0.00, 0.00) and physical activity status (p=0.00, 0.04). In addition, there is significant relationship between consumption of CBs and body mass index (p=0.02), tobacco smoking status and waist circumference (p=0.00) and abdominal obesity (p=0.03). Also, frequency and alcohol drinking status a significant correlation with BMI (p=0.00, p=0.00). Number of bottles of alcohol consumed had significant association with BMI (p=0.02) but not with WC (p=0.96) and abdominal obesity (p=0.29). WC and abdominal obesity had significant relationship with dietary habit of the respondents (p=p=0.02 and 0.04 respectively).

Discussion

This study assessed the behavioural risk factors of cardiovascular diseases among students in tertiary institutions in Abeokuta. This study revealed that most of the respondents were female and within the age-range of 20-24 years. Also, most of the respondents' parents were public servants and earned well above the minimum wage monthly. Majority of the undergraduates got finances from their parent and almost half of them had estimated monthly stipend above ten thousand naira.

The prevalence of smoking was low in this study;however, alcohol consumption prevalence was high with about a quarter consuming alcohol once daily and about one-fifth consuming alcohol three times or more daily (Table 2). Smoking and alcohol consumption have been associated with the risk of developing several non-communicable diseases including: cardiovascular diseases, cardiometric diseases, coronary heart diseases among others[11], as well as increased mortality and disability adjusted life years [7]. Quantity of tobacco smoked, quantity of alcohol consumed have also been associated with increased risk of developing cardiovascular diseases and death from cardiovascular diseases [7].

Among the respondents who smokes, about one-quarter smoke one stick of cigarette per day, almost half of them smoke two cigarettes per day and a quarter smoke three cigarettes per day. Also, about one-third of the respondents consumes at least one bottle of alcohol per day (Table 2).Physical inactivity, inadequate physical activity as well as poor dietary habit may lead to obesity and increase the risk of hypertension and other cardiovascular diseases [7, 26, 27, 28]. In this study, about one-third of the respondents do not engage in physical activity. Among the respondents who engaged in physical activity almost one-third engaged in physical activity for less than thirty minutes. Also, about two-third of the respondents had a fair dietary habit, about one-tenth had poor dietary habit and only one-tenth had good dietary habit (Table 2). Respondents in this study may be at increased risk of obesity and hypertension which are risk factors

Table 3: Nutritional anthropometry of the respondents

Variables	Male Median ± S.E	Female Median ± S.E	Total Median ± S.E	Variables	Male F (%)	Female F (%)	Total F (%)
Weight (kg)	60.30±0.77	57.20±0.58	59.30±0.48	**Body mass index**			
				Underweight	8 (6.1)	35 (16.1)	43 (12.3)
				Healthy weight	93 (71.0)	135 (61.6)	228 (65.0)
				Overweight	18 (13.7)	36 (16.4)	54 (15.4)
				General obese	12 (9.2)	13 (5.9)	25 (7.3)
				Total	131(100)	219 (100)	350 (100)
Height (cm)	160.00±0.60	163.00±3.36	1.63±0.28	**Waist circumference**			
BMI (kg/m ^{2})	22.94±0.32	22.07±0.35	22.60±0.30	Low	129 (98.5)	197 (90.0)	326 (93.1)
				High	2 (1.5)	22 (10.0)	24 (6.9)
				Total	131(100)	219 (100)	350 (100)
WC (cm)	76.00±0.62	74.00±4.94	75.05±0.46	**Abdominal Obesity**			
HC (cm)	86.20±0.54	88.10±0.67	88.10±0.46	Yes	36 (27.5)	59 (26.9)	95 (27.1)
WHR	0.87±0.05	0.85±0.60	0.85±0.00	No	95 (72.5)	160 (73.1)	255 (72.9)
WHtR	0.46±0.00	0.45±0.03	0.46±0.02	Total	131 (100)	219 (100)	350 (100)
				Disease risk classification			
				No risk	100 (76.3)	37 (16.8)	137
				Increased risk	18 (13.7)	152 (69.4)	170
				High risk	13 (9.9)	28 (12.7)	41
				Very high risk	0.0 (0.0)	2 (1.0)	2
				Extremely high risk	0.0 (0.0)	0.0 (0.0)	0
				Total	131 (100)	219 (100)	350 (100)

S.E – standard error

Table 4: Association of socio-economic characteristics and behavioural risk factors for cardiovascular diseases among respondents

Variables	Consumption of CBs		Smoking		Alcohol drinking status		Physical activity		Dietary habit score		BMI/BMI -for-age	Abdominal obesity
	χ^2	p-value	χ^2	p-value	χ^2	p-value	χ^2	p-value	χ^2	p-value	R (p-value)	R (p-value)
Gender	0.00	0.99	1.28	0.26	17.94	0.00*	4.43	0.11	7.72	0.05		
Age	18.98	0.00*	4.87	0.18	20.69	0.00*	13.53	0.04*	30.84	0.00*		
Marital status	0.83	0.36	0.31	0.58	13.21	0.00*	0.41	0.81	6.91	0.75		
monthly stipend	2.55	0.86	7.62	0.27	13.78	0.32	27.63	0.01	32.43	0.02*		
Father's education	14.05	0.03*	4.40	0.62	45.80	0.00*	15.28	0.23	31.55	0.03*		
Mother's education	32.96	0.00*	10.61	0.10	23.47	0.02*	18.63	0.10	43.49	0.00*		
Father's occupation	1.96	0.92	8.68	0.19	43.99	0.00*	23.06	0.03*	17.61	0.48		
Mothers' occupation	13.71	0.00*	40.10	0.00*	25.81	0.00*	19.40	0.01*	22.37	0.03*		
Father's estimated monthly income	2.20	0.90	4.94	0.55	41.10	0.00*	29.45	0.00*	23.96	0.16		
Mother's estimated monthly income	6.77	0.24	2.07	0.84	26.84	0.00*	18.47	0.04*	42.95	0.00*		
Major source of income	2.87	0.41	0.55	0.91	37.75	0.00*	25.09	0.00*	4.52	0.87		
Consumption of CBs											0.11 (0.02)*	0.06 (0.15)
Tobacco smoking											0.06 (0.15)	1.33 (0.03)*
No. of sticks smoked											0.01 (0.70)	-0.23 (0.59)
Alcohol consumption											-0.16 (0.00)*	-0.01 (0.76)
Frequency of alcohol drank											-0.14 (0.00)*	-0.05 (0.29)
No. of bottles drank											0.10 (0.02)*	0.00 (0.96)
Physical activity											-0.01 (0.75)	-0.02 (0.70)
Minutes of physical activity											0.03 (0.49)	-0.02 (0.60)
Dietary habit											-0.05 (0.27)	-0.09 (0.04)*

χ^2 – Chi-Square value, R – Correlation coefficient; CBs – carbonated beverages

for many cardiovascular diseases.

In this study, the prevalence of underweight in female is almost thrice that of male respondents (Table 3). Previous findings have reported similar findings owing to the fact that females are more conscious of their preventing increased body weight because of the desire to maintain thinner figure, keep fit and anxiety of becoming overweight. As a result, they tend to engage in dieting activities than their male counterpart [29].

Interestingly, overweight is also predominantly higher in female than male respondents. This finding is in contrast with previous findings where overweight was reported to be higher in male than female university students [30, 31]. On the contrary, general obesity was predominantly higher in male than female respondents(Table 3). This is similar to the findings of Arroyo et al [30] but contradicts the findings of Olusanya and Omotayo, [31]. The prevalence of abdominal obesity is quite high and almost the same in both male and female respondents (Table 3). Abdominal obesity has been implicated in the development of cardiovascular diseases [32, 33]. This suggests that the respondents in this study may be at risk of cardiovascular diseases.

Although,the World Health Organisation recommends the use of body mass index with the additional use of waist circumference to determine general obesity[25]. However, the National Heart, Lung, and Blood Institute Obesity Education Initiative Expert Panel [34] recommends that waist circumference should be used to classify overweight and obesity, estimate risk for disease, and identify treatment options in adults aged 18 years and older. This was based on the fact that individuals may have a healthy body weight and high waist circumference which puts the person at increased disease risk. Among the respondents who participated in this study, about ten percent male and two-third females had increased risk of disease, about ten percent males and females had high risk of disease, only few females had extremely high risk of disease while more than two-third males and about sixteen percent females had no disease risk. This imply that some respondents who had normal weight had high waist circumference which puts them at higher risk of diseases (Table 3).

Authors have revealed that income, educational level and age have significant impact on health [35]and lifestyle behaviours and hence pose the risk of developing obesity [36]. In this present study, association between socio-economic and behavioural risk factors for cardiovascular diseases among respondents. Findings from this study revealed significant association between gender and alcohol consumption status of the respondents. Also, increase in age significantly increased respondents' consumption of CBs, alcohol, physical activity and dietary habit score.Also, marital status had significant association with respondents' alcohol consumption status. Respondents' estimated monthly income had significant association with dietary habit score.This suggests that alcohol consumption is predominant in males than their female counterparts and as respondents increase in age, they increase their CBs and alcohol consumption, become more physically inactive and tend to poor dietary habit. Also, as respondents' income increases, they tend to a poorer dietary habit (Table 4).

In addition, Father and mother's educational level had significant association with respondents' consumption of CBs, alcohol consumption status and dietary habit score. Father and mother's occupation had significant association with respondents' alcohol consumption status ($p=0.00$, 0.00), physical activity while only mothers' occupation had significant association with respondents' consumption of CBs, smoking status and dietary habit score. Also, father and mother's estimated monthly income had significant association with respondent's alcohol consumption status and physical activity status, only mother's estimated monthly income had significant association with respondents' dietary habit. In addition, respondents' major source of income had significant association with respondents' alcohol and physical activity status.This suggests that the more learned respondents' parents are, the more the reduction in consumption of CBs, alcohol consumption and poor dietary habit and parents' occupation also play important role in respondents' alcohol consumption status and physical activity and mothers' occupation influences respondents' consumption of CBs, smoking status and dietary habit. Furthermore, parents' income influences respondents' alcohol consumption and physical activity while mother's income influences respondents' dietary habit. Findings from this study also imply that respondents who gets their major income from their parents had higher

alcohol consumption status and physical inactivity (Table 4).

The relationship between behavioural risk factors for cardiovascular diseases risk and nutritional anthropometry were evaluated in this study. There is positive correlation and significant relationship between consumption of CBs and body mass index, tobacco smoking status and waist circumference as well as abdominal obesity. However, a negative correlation although not significant was observed among number of sticks of tobacco smoked, waist circumference, and abdominal obesity. This imply that increase in CBs consumption significantly increase respondents' body mass index, while increase in tobacco smoking increased respondent's chances of having abdominal obesity. Conversely as respondents increased number of sticks of cigarette smoked, their chances of abdominal obesity reduce (Table 4). Previous finding suggests that unhealthy diet, excess alcohol consumption, smoking and physical inactivity significantly raised cardiovascular disease risk [3, 10, 11]. Keto et al [11] reported no clinicallysignificant difference among smokers and non-smokers with regards to risk for cardiovascular diseases, however, smokers had significantly higher blood pressure, blood glucose level and total cholesterol levels than non-smokers. Also, a study conducted revealed inverse association between physical activity, moderate alcohol consumption and type 2 diabetes while smoking was positively associated with type 2 diabetes [9]. This imply that smoking, alcohol consumption and physical inactivity, as well as unhealthy dietary lifestyle may predispose respondents to non-communicable diseases, particularly cardiovascular disease.

Also, increase in frequency of alcohol and alcohol consumption had significant negative correlation on BMI, but does not significantly influence waist circumference and abdominal obesity of respondents. This suggests that alcohol consumption may have positive influence on body fat. Also, number of bottles of alcohol consumed had significantrelationshipwith body mass index of respondents while increase in physical activity had negative correlation with respondents BMI, WC and abdominal obesity, although not significantly. This suggests that increased physical activity may have positive impact on respondents' body weight and abdominal obesity.In addition, there was negative correlation between dietary habit, body mass index, WC and abdominal obesity, however, only WC and abdominal obesity had significant relationship with dietary habit of the respondents (Table 4). This agrees with the previous findings of where there was association between unhealthy diet, smoking, alcohol consumption and physical activity and obesity [37, 38, 39]. This suggests consumption of diets that increases respondents' body weight and body fat which may predispose them to the risk of cardiovascular diseases.

Conclusion

Although, the prevalence of smoking and physical inactivity is low, however, there is high prevalence of alcohol drinking, poor dietary habit, increased frequency of alcohol drinking and number of sticks of cigarette smoked among respondents. Also,underweight, overweight and disease risk were predominantly higher in females than males but abdominal obesity is high in both male and female respondents. There is significant association and relationship among socio-economic and behavioural risk factors of the respondents.

Recommendations

Behavioural lifestyle of respondents should be modified to ensure healthy lifestyle in order to reduce the risk of cardiovascular diseases among university students, particularly healthy dietary practices and reduction in number of bottles of alcohol consumed. Also, increase in physical activities for at least thirty minutes per day will promote reduction in respondents' body weight and abdominal obesity.

References

1. World Health Organization.(2016) Cardiovascular Disease (CVDs) Fact Sheet. WHO, Geneva. www.who.int
2. Lu H, Pan WZ, Wan Q, Cheng LL, Shu XH, et al. (2016) Trends in the prevalence of heart diseases over a ten-year period from single-center observations based on a large echocardiographic database. J Zhejiang University Sci 17: 54-59.
3. Lucero A.A, Lambrick, D.M, Faulkner J.A, Fryer S, Tarrant M.A, Poudevigne M, Williams M.A and Stooner L.(2014). Modifiable Cardiovascular Disease Risk Factors among Indigenous populations. Advances in preventive medicine. 1-13
4. Bennett D.A, Du H and Clarke R.(2017). Association of physical activity

with risk ofmajor cardiovascular diseases in Chinese men and women. JAMA Cardiology. 2(12): 1349-1358.
5. Trijsburg, L., Talsma, E.F., de Vries, J.H.M., Kennedy, G Kuijsten, A. and Brouwer, I.D. (2019). Diet quality indices for research in low- and middle-income countries: a systematic review. Nutrition Reviews, Vol. 0(0):1–26. doi: 10.1093/nutrit/nuz017
6. World Health Organization. (2014). Global Status Report on non-communicable Disease. Switzerland, Geneva. 10-14
7. Ruiz-Nunez, B., Pruimboom, L., Dijck-Brouwer, D. A. J. and Muskiet, F. A. J. (2013). Lifestyle and nutritional imbalances associated with Western diseases: causes and consequences of chronic systemic low-grade inflammation in an evolutionary context. *Journal of Nutritional Biochemistry*, 24(7), 1183-1201.
8. Lachat C, Otchere S, Roberfroid D, Abdulai A, SeretFMA, et al. (2013) Diet and Physical Activity for the Prevention of Noncommunicable Diseases in Low- and Middle-Income Countries: A Systematic Policy Review. PLoS Med 10(6): e1001465. doi:10.1371/journal.pmed.1001465
9. OlatonaF.A, Onabanjo O.O, UgbajaR.N, NnoahamK.E and Adelekan D.A.(2018). Dietary habits and metabolic risk factors for non-communicable diseases in a university undergraduate population. Journal of Health, Population and Nutrition 37:21 https://doi.org/10.1186/s41043-018-0152-2
10. World Health Organisatio (2014). World Health Statistics. World Health Organisation, Geneva, Switzerland. 122-123
11. Global Nuriion Report(2017). Nourishing the SDGs. Tracking Progress, Strengthening Accountability, Reducing Malnutrition.1-26
12. Shi Liang, Shu Xiao-Ou, Li Honglan, Cai Hui, Liu Qiaolan, Zheng Wei , Xiang Yong-Bing, Villegas Raquel (2013). Physical Activity, Smoking, and Alcohol Consumption in Association with Incidence of Type 2 Diabetes among Middle-Aged and Elderly Chinese Men. PLoS ONE 8(11): e77919. doi:10.1371/journal.pone.0077919
13. Lee J.A, ChaY.H, Kim S.H and Park H.S. (2016). Impact of combined lifestyle factors on metabolic syndrome in Korean men. Journal of Public Health. Vol. 39, No. 1, pp. 82–89. doi:10.1093/pubmed/fdv208
14. Keto J., Ventola H., Jokelainen J., Linden K., Keinänen-Kiukaanniemi S., Timonen M., Ylisaukko-oja T, Auvinen J. (2016). Cardiovascular disease risk factors in relation to smoking behaviour and history: a population-based cohort study. Open Heart 2016;3: e000358. doi:10.1136/ openhrt-2015-000358
15. AkterSFU, Fauzi ARM, Nordin MS, Satwi S, Mohamed A, et al. (2010) Prevalence of cardiovascular risk factors in a selected community at Kuantan, Pahang, Malaysia. Int J Med Med Sci 2: 322-328.
16. Otgontuya D, Oum S, Buckley BS, Bonita R (2013) Assessment of total cardiovascular risk using WHO/ISH risk prediction charts in three low- and middle-income countries in Asia. BMC Public Health 13: 1.
17. Zhao X, Xi B, Shen Y, Wu L, Hou D, Cheng H, et al. (2014) An obesity genetic risk score is associated with metabolic syndrome in Chinese children. Gene.;535:299–302.
18. Song HJ, Hwang J, Pi S, Ahn S, Heo Y, Park S, et al. (2018) The impact of obesity and overweight on medical expenditures and disease incidence in Korea from 2002 to 2013. PloS ONE 13(5): e0197057. https://doi.org/10.1371/journal.pone.0197057
19. Chen Y, Rennie D.C, Karunanayake C.P , Janzen B , Hagel L, Pickett W , Dyck R , Lawson J , DosmanJ.A, Pahwa P and the Saskatchewan Rural Health Study Group. (2015). Income adequacy and education associated with the prevalence of obesity in rural Saskatchewan, Canada. BMC Public Health. 15:700 DOI 10.1186/s12889-015-2006-9
20. Ghorpade AG, Shrivastava SR, Kar SS, Sarkar S, Majgi SM, et al. (2015) Estimation of the cardiovascular risk using World Health Organization/International Society of Hypertension (WHO/ISH) risk prediction charts in a rural population of South India. Int J Health Policy Manag 4: 531-536
21. Lindgren CM, Heid IM, Randall JC, Lamina C, Steinthorsdottir V, Qi L, et al. (2010) Genome-wide association scan meta-analysis identifies three loci influencing adiposity and fat distribution. PLoS Genet. 2009;5:e1000508.
22. Li M. and McDermottR. A. 2010 "Using anthropometric indices to predict cardio-metabolic risk factors in Australian

indigenous populations," Diabetes Research and Clinical Practice, vol. 87 (3), pp. 401–406.
23. Heid IM, Jackson AU, Randall JC, Winkler TW, Qi L, Steinthorsdottir V, et al. (2010). Meta-analysis identifies 13 new loci associated with waist-hip ratio and reveals sexual dimorphism in the genetic basis of fat distribution. Nat Genet. 42:949–60.
24. Cepeda B. -Valery, G. S. Pressman, V. M. Figueredo, and A. Romero-Corral (2011). "Impact of obesity on total and cardiovascular mortality-fat or fiction?" Nature Reviews Cardiology, vol. 8, no. 4, pp. 233–237.
25. Ashwell M (2012) Plea for simplicity: use of waist-to-height ratio as a primary screening tool to assess cardiometabolic risk Clinical Obesity 2: 3–5.
26. Ashwell M, Mayhew L, Richardson J, Rickayzen B (2014) Waist-to-Height Ratio Is More Predictive of Years of Life Lost than Body Mass Index. PLoS ONE 9(9): e103483. doi:10.1371/journal.pone.0103483
27. Browning L, Hsieh S, Ashwell M (2010) A systematic review of waist-to-height ratio as screening tool for the prediction of cardiovascular disease and diabetes: 0.5 could be a suitable global boundary value. Nutrition Research Reviews 23: 247–269
28. World Health Organization (2000) Obesity: preventing and managing the global epidemic. Report of a WHO consultation. http://whqlibdoc.who.int/trs/WHO_TRS_894.pdf, accessed 20 June 2009
29. Payab M, Kelishadi R, Qorbani M, Motlagh ME, Ranjbar SH, Ardalan G, et al. (2015). Association of junk food consumption with high blood pressure and obesity in Iranian children and adolescents: the CASPIAN-IV Study. J Pediatr (Rio J) 91:196---205.
30. Cha E, AkazawaM.K, Kim K.H, Dawkins C.R, Lerner H.M, Umpierrez G, and Dunbar S.B. (2015). Lifestyle habits and obesity progression in overweight and obese American young adults: Lessons for promoting cardiometabolic health. Nurs Health Sci.; 17(4): 467–475. doi:10.1111/nhs.12218
31. WhatnallM.C, Collins C.E , Callister R and HutchessonM.J(2016). Associations between Unhealthy Diet and Lifestyle Behaviours and Increased Cardiovascular Disease Risk in Young Overweight and Obese Women. Healthcare, 4, 57; doi:10.3390/healthcare4030057
32. Isa K.A and Masuri M.G. (2011). The association of breakfast consumption habit, snacking behavior and body mass index among university students American Journal Of Food And Nutrition: ISSN 2157-1317, doi:10.5251/ajfn.2011.1.2.55.60
33. Arroyo Izaga, M., A.M. Rocandio Pablo, L. AnsoteguiAlday, E. PasualApalauza, I. SalcesBeti and E. Rebato Ochoa, (2006). Diet quality, overweight and obesity in universities students. Nutr. Hosp., 21: 673-679.
34. OlusanyaJ.O and Omotayo O.A. (2011). Prevalence of Obesity among Undergraduate Students of Tai Solarin University of Education, Ijagun, Ijebu-Ode J.O. Olusanya and O.A. Omotayo. Pakistan Journal of Nutrition 10 (10): 940-946, 2011 ISSN 1680-5194
35. Huxley R, Mendis S, Zheleznyakov E et al. (2010) Body mass index, waist circumference and wais:hip ratio as predictors of cardiovascular risk—a review of the literature. Eur J Clin Nutr 64:16–22
36. Bergman RN, Stefanovski D, Buchana TA et al (2011) A better index of body adiposity. Obesity 19(5):1083–1089
37. National Heart, Lung, and Blood Institute Obesity Education Initiative Expert Panel. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults (2002). Available at: http://www.nhlbi.nih.gov/nhbli/htm.
38. Zimmerman E.B, Wolf S. H and Haley A (2015). Understanding the Relationship between Education and Health. A review of the evidence and an examination of community perspectives, Agency for Healthcare Research and Quality, Rockville, Population Health: Behavioural and Social Science Insights. http://www.ahrq.gov/professionals/education/curriculum-tools/population-health/zimmerman.html
39. Chen Y, Copeland WK, Vedanthan R, Grant E, Lee JE, et al. (2013) Association between body mass index and cardiovascular disease mortality in east Asians and south Asians: pooled analysis of prospective data from the Asia Cohort Consortium. Br Med J 347: 5446.
40. Egger G and Dixon J. (2014). Beyond Obesity and Lifestyle: A review of 21st century

chronic disease determinants. BioMed Research International Volume 2014, Article ID 731685, 12 pages http://dx.doi.org/10.1155/2014/731685

41. Stenhold s, Head J, Kivimaki M, Kawachi I, Aalto V, Zins M, Goldberg M, Zaninotto P, Magnuson H, Westerlund H and Vahtera J. (2016). Smoking, physical inactivity and obesity as predictors of healthy and disease-free life expectancy between ages 50 and 75: a multicohort study. International Journal of Epidemiology, 2016, 1260–1270 doi: 10.1093/ije/dyw126

42. Wahid A, Manek N, Nichols M, Kelly P, Foster C, Webster P, Kaur A, Smith C, Wilkins E, Rayner M, Roberts N, Scarborough P. (2016). Quantifying the Association between Physical Activity and Cardiovascular Disease and Diabetes: A Systematic Review and Meta-Analysis. J Am Heart Assoc. 2016;5:e002495 doi: 10.1161/JAHA.115.002495