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Dyslipidemia among medical college students in Basrah: a cross-sectional study of patterns and risk factors

Zainab A. Al- Mayyahi[1,*], Entissar Abdul latif Abdul Reda[2]

[1] University of Basrah, College of Medicine, Department of Medicine, Basrah, Iraq.
[2] University of Basrah, College of Medicine, Department of Biochemistry, Basrah, Iraq.

***Corresponding author:** Zainab A. Al- Mayyahi MD.
Department of Medicine, College of Medicine, University of Basrah,
Al-Bradheia, Basrah, Iraq. Tel: +964-7707070471.
E-mail: zainab.akber@uobasrah.edu.iq
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Abstract

Introduction: Dyslipidemia is a well-known metabolic derangement closely associated with atherosclerosis and cardiovascular diseases. In recent years, it has been increasingly recognized as an emerging health concern among young populations. Medical college students, due to lifestyle changes coupled with academic and social pressures, are at particular risk. The aim of this study is to assess the extent and pattern of dyslipidemia among medical college students at the University of Basrah, identifying possible preventable lifestyle behaviors and environmental risk factors. **Patients and Methods:** A total of 330 (241 male and 89 female) randomly selected apparently healthy medical college students were included in this cross-sectional study. Over- night fasting, lipid profile blood samples were collected. Dietary and behavioral information of the participants, in addition to demographic and anthropometric data, were recorded using structured questionnaires and direct measurements. All biochemical, anthropometric, and demographic data were collected and analyzed. **Results:** Out of a total number of 330 participants, 175 students (53%) were found to have at least one abnormal lipid profile. Low HDL-C was the most prevalent form of dyslipidemia among the studied population, representing around 46.97% fallowed by high levels of low-density lipoprotein (LDL-C), which was found in 40.9% of subjects, while 37.88% have elevated triglycerides (TG) levels and 30% have high total cholesterol (TC) levels . These dyslipidemias were significantly more prevalent in males than females and in smokers than non-smokers. Analysis of demographic and anthropometric data showed that dyslipidemia was significantly more prevalent in participants from the faculty of Medicine and in those who were physically inactive, had unhealthy eating habits, and those with high waist circumference or a BMI value more than 25 kg/m2. **Conclusion:** Dyslipidemia is a prevalent condition among medical college students. Risk factors that substantially contribute to dyslipidemia include male sex, smoking, junk food eating, central obesity, social stress, and physical inactivity.

Keywords: Dyslipidemia. Medical College Students. Prevalence. Risk Factors. Lifestyle.

Introduction

Dyslipidemia is a major public health concern that contributes significantly to the global burden of cardiovascular disease and metabolic disorders [1]. Dyslipidemia is characterized by one or more abnormal lipid profile levels in the blood including elevated total cholesterol (TC), elevated low-density lipoprotein (LDL-C) cholesterol, increased triglycerides (TG) and decreased high- density lipoprotein (HDL_C) cholesterol [2]. The global prevalence of dyslipidemia is around 20% to 40% with the highest prevalence observed in Middle East and Latin America [3]. Dyslipidemia represents the 8th cause of death in the world [1].

Dyslipidemia once occurs in early adulthood increases the future risk of CVD and Measuring cholesterol levels in early twenties can predict the

likelihood of CVD development at the ages of fifties or sixties [4]. It is well known that CVD contributes to around one third of annual deaths around the world and treating dyslipidemia as a modifiable risk factor for CVD will greatly reduce the risk of development of CVD [5]. Middle East region including Iraq are considered among the highest CVD-associated mortality rate countries [6].

According to the World Health Organization, CVD-associated mortality in Iraq accounts for 27% of total annual deaths [7]. College students are at particular risk of having abnormal lipid profile as university life often promotes unhealthy behaviors that increase the risk of obesity and dyslipidemia [8]. Poor dietary choices are one of the primary contributing factors, as many students prefer energy dense, high-calorie and processed foods due to time constraints and convenience. Fast food, sugary beverages, and snacks high in saturated and trans-saturated fats become staples in their diet, leading to excessive caloric intake, increased weight and lipid profile imbalances [9].

Coupled with this, physical inactivity and sedentary life style promoted by spending long hours attending lectures and studying which had become mainly screen- based . This reduction in physical activity lowers energy expenditure and increase the risk of weight gain and metabolic disturbances. [10]. Stress, on the other hand is another significant contributor to these conditions as academic pressures, financial burdens, and social challenges create high levels of stress, which often leads to emotional eating and reliance on unhealthy dilatory choices. Chronic stress also elevates cortisol levels, promoting fat accumulation; particularly in the abdominal region leading to more metabolic derangements [11].

Sleep deprivation is another contributing factor as many students experience irregular sleep patterns due to late- night studying and poor sleep is associated with insulin resistance, increased appetite, and decreased ability to regulate weight, further contributing to the development of dyslipidemia [12]. The global prevalence of dyslipidemia in young has increased dramatically over the past few decades [13].

In Iraq and other Middle Eastern countries, the prevalence of dyslipidemia has risen due to urbanization, increased consumption of Western-style fast food, and decreased levels of physical activity [14-16]. Many studies suggest that over 25% of young adults exhibiting high cholesterol and triglyceride levels [17]. Preventing and managing dyslipidemia require lifestyle modifications; including adopting a balanced diet, engaging in regular physical activity, managing stress, and ensuring adequate periods of sleep [19].

National health services should focus on promoting university educational programs that increase awareness about risk factors and future consequences of dyslipidemia and emphasizes the advantages of adopting healthy eating habits, avoiding poor lifestyle choices, and encouraging regular physical activity [19]. This can also be achieved by encouraging regular health screenings and early nutritional counseling to identify individuals' risk factors and early introduction of healthy lifestyles in order to reduce future morbidities that may be associated with this condition [20]. In Middle East and Iraq few studies had address the prevalence of dyslipidemia in college students and non-had been conducted in the region of Iraq. Basrah is a densely populated governorate located in the south of Iraq.

This study aimed to qualify the extent and pattern of dyslipidemia among medical college students in Basrah, Iraq, and to identify possible contributing risk factors through analysis of demographic and lifestyles parameters including dietary habits, physical activity levels in addition to environmental and social factors in order to establish early educational programs that aim to reduce long-term public health burden and future morbidity associated with the presence of dyslipidemia in early adulthood.

Methods

Study Design, Sample Size, Eligibility

This study developed a cross-sectional observational descriptive qualitative and quantitative epidemiological study with non-probabilistic sampling, following the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) rules. Available at: https://www.strobestatement.org/checklists/. Accessed on: 02/24/2025. This is a cross-sectional study carried out at University of Basrah through a period of six months, from October 2024 till March 2025. A total number of 330 apparently healthy randomly selected college students (241 males and 89 females) aged between 18-25 years attending University of Basrah participate in the study. Students were chosen from three faculties of University of Basrah (Medicine, Dentistry and Pharmacy). Stratified sampling technique was used to include students from all academic years. Students were selected using clustering technique inside each faculty for each academic year using sections and practical lessons groups which usually includes around 25 students for each group. Two or three groups were randomly selected in each academic year. The study sample was calculated based on the 27% prevalence of CVD-associated death in Iraq according to WHO [7]. The

calculated required sample size was 220. A total of 400 students aged between 18-25 years were chosen randomly from three faculties of University of Basrah (Medicine, Dentistry and Pharmacy). All participants filled a questionnaire form including full medical history, dietary and lifestyle information, socio-demographic data, and were provided with a written informed consent. A total number of 330 students (241 males and 89 females) completed the study and were included in the final analysis.

Ethical Approval

Ethical approval was obtained from the ethical board of College of Medicine. Informed consent form was applicable.

Procedures and Analysis

After explaining the aim of the study to the students, they were asked to fast over night before blood samples collection, at the same time anthropometric measurements were performed. Height and weight of the students were measured bare feet in standing position using calibrated height-weight scale, BMI then were calculated by dividing the weight (kg) by the square of the height (m). Waist circumference (WC) was recorded in cm using a tape measure in standing position at the midpoint between the lower costal margin and the iliac crest.

Fasting blood samples were centrifuged and stored for biochemical analysis. Blood samples were analyzed using Cobas integra 400 plus Roche biochemical analyzer (®Roche diagnostics, Germany), levels of total cholesterol (TC), triglycerides (TG), low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein cholesterol (HDL-C) were recorded.

Dyslipidemia was defined as Hypertriglyceridemia (TG levels ≥ 150 mg/dL, hypercholesterolemia (TC ≥ 200 mg/dL, high LDL-C (levels ≥130 mg/dL, low HDL-C (levels < 40 mg/dL in men or <50 mg/dL in women **[21]**.

Overweight was defined as BMI ≥25 kg/m^2 and <30 kg/m^2, while obesity was defined as BMI ≥ 30 kg/m^2 **[22]**. Central obesity was defined as waist circumference ≥ 102 cm in men or ≥82 in women **[23]**. Smoking status including cigarettes, vape and hookah smoking was classified as smokers and non-smokers.

Level of physical activity was classified into active or sedentary; active includes participants who engaged in moderate intensity physical activity for at least 150 minutes throughout the week **[24]**. Frequent fast-food eating was defined as consumption of three or more fast food meals per week like deeply fried food, pizza and burgers.

Statistical Analysis

After data collection statistical analysis was performed using IBM SPSS® software version 26, and results were expressed as mean± slandered deviations and percentages. . Independent t-tests and Chi-square tests were used to compare between different groups, *p*-value of < 0.05 was considered significant.

Results

Demographic data of the subjects included in the study are shown in Table 1. A total number of 330 medical college students (241 males and 89 females) aged between 18-25 years (mean= 21.3 ±2.1) were included in the study. Females constitute 27% of the participants while males represent the majority of 73%. Of The total number participants 32 % were above 22 years old. The majority of the students were from the faculty of Medicine representing 49.7 % of the participants, the rest were from the faculties of Dentistry and Pharmacy representing 31.2% and 19.1% respectively. Smokers comprised about 30 % of the students, with a significantly higher prevalence among males. Only eight participants (all males) report occasional irregular alcohol drinking. Regarding dietary habits, the majority of students (around 69%) consume three or more fast food meals per week, on the other hand only 39.3 % of the students reported regular levels of physical activity while the rest of the majority had sedentary lifestyle.

Table1. Demographic data of the subjects included in the study.

Variables		Number/ Percentage (n/%)
Sex	Male	241 (73%)
	Female	89 (27%)
Age (years)	18-25	100%
	Mean 21.3 ± 2.1	
	< 22	224 (180M, 44F) (68%)
	≥ 22	106 (61M, 45F) (32%)
Faculty	Medicine	164 (120M, 44F) (49.7%)
	Dentistry	103 (75M, 28F) (31.2%)
	Pharmacy	63 (46M, 17F) (19.1%)
Smoking status	Smoker	99 (83M, 16F) (30%)
	Non-smoker	231 (158M, 73F) (70%)
Alcohol consumption	Yes	8(8M, 0F) (2.42%)
	No	322 (233, 89F) (97.57%)
Physical activity Level	Active	130 (91M, 39F) (39.3%)
	Sedentary	200 (150M, 50F) (60.6%)
Fast food consumption	≥3 times/week	228 (186M, 42F) (69.09%)
	<3 times/week	102 (45M, 57F) (30.91%)

M: males, F: females. Source: Own authorship.

Anthropometric parameters of the study participants according to sex are shown in Table 2. Males had a significantly higher average weight and higher average height than females p=0.001 and p<0.001 respectively. BMI values of the males and

female participants were within the average of normal however there were a significant difference between males and females p=0.04. Waist circumference for both groups fall within the average of normal for each sex with a significant difference between the two groups p=0.02.

Table 2. Anthropometric parameters of study participants according to sex.

Parameter	Male (Mean ± SD)	Female (Mean ± SD)	*p*-value
Weight (kg)	76.2 ± 11.5	63.1 ± 12.8	0.001
Height (cm)	175.3 ± 6.2	160.8 ± 4.1	<0.001
BMI (kg/m²)	25.1 ± 3.8	23.4 ± 4.0	0.04
Waist Circumference (cm)	85.1 ± 9.8	76.2 ± 7.9	0.02

SD: standard deviation. Source: Own authorship.

The mean Concentrations of Lipid Profiles According to Sex are shown in Table 3. Males had a mean LDL-C concentration of 138.4 ± 42.2 mg/dL which exceeds the optimal threshold of <130 mg/dL and was significantly higher than the mean concentration of LDL-C in females p=0.018. The HDL-C mean concentration level in males was 37.1 ± 7.2 mg/dL which is below the recommended level of >40 mg/dL for men, while females had a slightly higher but still borderline level of 38.9 ± 6.8 mg/dL compared to the recommended level of >50 mg/dL for women. The mean levels of total cholesterol and triglycerides were also higher in male than females with a statistically significant difference between the two groups and p values equal to 0.025 and 0.032 respectively.

Table 3. Mean concentrations of lipid profiles according to Sex.

Lipid Profile Parameter	Male n=241 (Mean ± SD)	Female n=89 (Mean +SD)	Total n=330 (mean + SD)	*p-value*
LDL-C (mg/dL)	138.4 ± 42.2	109.2 ± 21.5	122.05+38.7	0.018
HDL-C (mg/dL)	36.3 ± 6.9	49.8 ± 6.5	39.62+6.7	0.045
Total Cholesterol (mg/dL)	198.6 ± 29.3	176.7 ± 27.9	187.5+28.4	0.025
Triglycerides (mg/dL)	169.2 ± 39.7	142.4 ± 35.6	148..8+34.7	0.032

SD: standard deviation. Source: Own authorship.

The patterns of dyslipidemia among study participants are shown in Table 4. Dyslipidemia was highly prevalent among the students with around 53% of them having at least one parameter of dyslipidemia. Low HDL-C level was found in 46.97% of subjects. High levels of LDL-C, total cholesterol, and triglycerides were found in 40.9%, 30% and 37.88% respectively. All patterns of dyslipidemia were more prevalent in male participants.

Table 4. Patterns of dyslipidemia among study participants.

Dyslipidemia Parameter	Frequency (n)	Percentage (%)
High LDL-C (>130 mg/dL)	135 (115M, 20F)	40.9%
Low HDL-C (<40 mg/dL)	155 (135M, 20F)	46.97%
High Total Cholesterol (>200 mg/dL)	99 (79M, 20F)	30%
High Triglycerides (>150 mg/dL)	125(98M, 27F)	37.88%
At least one parameter affected	175 (151M, 24F)	53%

M: males, F: females. Source: Own authorship.

The association of dyslipidemia with demographic characteristics and obesity are shown in Table 5. Males had a significantly higher prevalence of dyslipidemia compared to females with a p-value of 0.02. Dyslipidemias were more prevalent in students aged 22 years and older than younger students but the difference between the two groups was not significant (p=0.08). Students with a BMI of 25 kg/m^2 or higher were significantly more likely to have dyslipidemia than those with a BMI of less than 25 kg/m^2 (p = 0.015), none of the participants had a BMI of 30 kg/m^2 or more. Central obesity represented by increased waist circumference compared to optimal in both males and females show a strong association with the prevalence of dyslipidemia (p = 0.008).

Table 5. Association of dyslipidemia with demographic characteristics and obesity.

Demographic		Dyslipidemia Present (n/%)	Dyslipidemia Absent (n/%)	*p*-value*
Sex	Male Female	(169/70.13%) (49/55%)	(72/29.87%) (40/45%)	0.02
Age (years)	≥22 <22	(60/56.6%) (96/42.86%)	(46/43.4%) (128/57.14%)	0.08
BMI	<25 kg/m^2 ≥25 kg/m^2	(131/50.78%) (56/87.96%)	(127/49.22%) (16/12.03%)	0.015
WC	Normal ≥102 cm in male Or ≥82 cm in female	(98/41.53%) (65/69.15%)	(138/58.47%) (29/30.85%)	0.008

BMI: body mass index, WC: Waist Circumference. * *P*-value for association with dyslipidemia. Source: Own authorship.

The associations of dyslipidemia with lifestyle factors and physical activity are shown in Table 6. Smoking was strongly linked to abnormal lipid profiles as 74.75% of smokers have dyslipidemia compared to 25.25% of non-smokers; the link was statistically significant (p < 0.01). Physical inactivity had also been strongly associated with dyslipidemia being more prevalent in sedentary students with a prevalence of 62% compare to 37.69% for physically active students (p < 0.05). Between faculties, a significantly higher prevalence of dyslipidemia was observed among students from faculty of Medicine compared to Dentistry and Pharmacy faculties (p=0.01). Alcohol consumption did not show significant correlations with dyslipidemia in our study. Fast food consumption had been strongly associated with the prevalence of dyslipidemia. Students who consume three or more fast food meals per week had an increased prevalence

of dyslipidemia compared to those who consume less than three meals per week representing 42.86% and 19.81% respectively and the difference between the two groups was statistically significant (p=0.005).

Table 6. Associations of dyslipidemia with lifestyle factors and physical activity.

Lifestyle Factor		Dyslipidemia Present (n/%)	Dyslipidemia Absent (n/%)	p-value*
Smoking	Yes	(74/74.75%)	(25/25.25%)	<0.01
	No	(50/ 21.65%)	(181 / 78.35%)	
Physical Activity	Active	(49/37.69%)	(81/62.31%)	<0.05
	sedentary	(124/62%)	(76/ 38%)	
Faculty	Medicine	(109/66.5%)	(55/33.5%)	0.01
	Dentistry	(40/38.8%)	(63/61.2%)	
	Pharmacy	(26/41.3%)	(37/58.7%)	
Alcohol Consumption	Yes	(2/25%)	(6/75%)	0.08
	No	(70 /21.74%)	(252/ 78.26%)	
Fast food consumption	≥3 times/week	(96/42.86%)	(128/57.14%)	0.005
	<3 times/week	(21/ 19.81%)	(85 /80.19%)	

* p-value for association with dyslipidemia . Source: Own authorship.

Discussion

Dyslipidemia have been increasingly recognized as a global health problem. In recent years its prevalence increased in young age population with subsequent adverse outcome in later years of life. This study was designed to assess the prevalence, patterns and risk factors associated with dyslipidemia among young age medical college students in University of Basrah in Basrah, Iraq aiming to introduce established strategies to possibly prevent and correct modifiable risk factors of dyslipidemia.

The results of our study showed that 53% of the students had at least one parameter of dyslipidemia. Low HDL-C being the most prevalent lipid profile abnormality constituting for about 46.97% fallowed by high LDL-C representing 40.9% while 37.88% presented with elevated triglycerides levels and 30% had high total cholesterol. All forms of dyslipidemia were more prevalent in males than in females a finding which is well established by many studies **[25,26]**.

Lifestyle behaviors also played a crucial role in the prevalence of dyslipidemia in our study. Notably, Central obesity and overweight show a strong correlation with dyslipidemia which can be explained by the nature of the carbohydrates rich traditional Iraqi diet in addition to the recently introduced calorie dense western type fast food and physical inactivity, similar correlation was also proved previously by a number of studies worldwide, Srinivasan SR et al. **[27]** and AlMajed HT et al. **[28]**.

In the present study dyslipidemia was strongly associated with frequent junk food eating affecting around 70% of student who consume three or more fast food meal per day. The protective effect of physical activity was evident in our study as only 37.69% of physically active students were affected by dyslipidemia compared to 62% of sedentary students who constitute the majority of the participants. These results were also reached by Abdel Wahed W.Y. et al. and Racette SB et al **[29,30]**.

In this study smoking was recorded in 30% of student participants of which around 75% had dyslipidemia reflecting the established link between smoking and adverse lipid profiles **[31]**. Despite the well-known association between alcohol conception and dyslipidemia proved by many studies **[32]** , this study did not find significant associations between alcohol consumption and dyslipidemia probably because of the small number of participants in this group or because of the short and irregular durations of alcohol drinking.

One of the prominent finding in this study is that dyslipidemia was more prevalent among students from the faculty of Medicine than the other two faculties, reflecting that academic and social stress may play a role in the development of dyslipidemia. Spending long hours spend in attending lectures and studying leaves little time for physical activity and prevent healthy dietary choices, in addition sleep deprivation and social stress induces high cortisol blood levels and promote the development of overweight and central obesity. This finding came in concordance with the findings of Al-Duais MAet al. **[33]**.

No similar study was conducted in Iraq involving the same group of population however, several studies were conducted in neighbor Middle East countries. In Kuwait, AlMajed HT et al. found that dyslipidemia was prevalent among college students with male being affected more than females and central obesity was the most prominent risk factor **[28]**. In Saudi Arabia, Hamam F et al. found that dyslipidemia was prevalent in the university community, affecting around 60% of students, with low HDL-C being the most prevalent lipid profile abnormality, similar to the findings in our study **[34]**.

In Iran Khanali, J et al. reported that around 40% of adults in Iran presented with dyslipidemia with a positive correlation with age, male gender and BMI **[35]**. All of these studies are in accordance with the results of our study indicating a consistent trend across societies which shares approximately the same lifestyle and dietary habits.

In Yemen, Al-Duais MA et al. found that dyslipidemia was more prevalent among faculty of Medicine Yemeni students than other faculties students, affecting males and smoker rather than females and non-smokers a finding which consistent with the results of our study however, the association of dyslipidemia

with overweight was not very evident possibly because the circumstances of war and poverty [33]. Abdel Wahed W.Y et al. found that dyslipidemia affect 44.3% of Fayoum university students in Egypt with overweight, physical inactivity and unhealthy dietary habits being the most important associated factor, their finding was confirmed by present study [28].

In other parts of Asia, Liu et al. found that dyslipidemia was prevalent among students in China with male sex, smoking and overweight being constant risk factors [25]. Pootong A et al. reaches the same finding in student population in Thailand [36]. Across the world Srinivasan et al also prove the direct correlation between central obesity and dyslipidemia [27] and Racette et al. emphasizes the role of regular physical activity in improving lipid profile and reducing cardiovascular risk among young adults [30].

The concordance of the results from different regions of the world proves that most of the risk

factors of dyslipidemia are related to overweight, inactivity and unhealthy lifestyles rather than genetic, ethnic or geographical factors, thus modifying these factors by introducing university educational programs to motivate this group of population about healthy lifestyle and regular exercise will greatly limit the extant of the problem and prevent future public health burdens.

Limitations

Limitations of this study are the small sample size based on one state of the country which may limit the generalizability of the findings to a larger population. The use of convenience sampling could introduce selection bias, and self-reported data on lifestyle behaviors such as diet, smoking and alcohol consumption may be subjected to recall bias or underreporting. Additionally, the short study duration may not account for seasonal variations in lifestyle and health behaviors, and the lack of a fully detailed dietary assessment prevents a comprehensive analysis of other nutritional influences on patterns and levels of dyslipidemia.

Conclusion

Dyslipidemia was prevalent among medical college students in University of Basrah. Low HDL-C was the most recognizable type of dyslipidemia. Significant risk factors were male gender, smoking, central obesity, frequent fast-food eating, social stress and physical inactivity. These results indicate the necessity for targeted educational programs to prevent and decrease the risk of dyslipidemia and related subsequent cardiovascular diseases in this age group of population.

CRediT

Author contributions: **Conceptualization-** Zainab A. Al- Mayyahi, Entissar Abdul latif Abdul Reda. **Data curation-** Zainab A. Al- Mayyahi, Entissar Abdul latif Abdul Reda; **Formal Analysis-** Zainab A. Al- Mayyahi, Entissar Abdul latif Abdul Reda; **Investigation-** Zainab A. Al- Mayyahi, Entissar Abdul latif Abdul Reda; **Methodology-** Zainab A. Al- Mayyahi, Entissar Abdul latif Abdul Reda; **Project administration-** Zainab A. Al- Mayyahi, Entissar Abdul latif Abdul Reda; **Writing - original draft-** Zainab A. Al- Mayyahi, Entissar Abdul latif Abdul Reda; **Writing-review & editing-** Zainab A. Al- Mayyahi, Entissar Abdul latif Abdul Reda.

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Ethical Approval

This study was approved by the Research Ethics Committee from the ethical board of College of Medicine.

Informed Consent

It was applicable.

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Data Sharing Statement

All referenced sources are accessible through the respective journals or public repositories.

Conflict of Interest

The authors declare no conflict of interest.

Similarity Check

It was applied by Ithenticate®.

Application of Artificial Intelligence (AI)

Not applicable.

Peer Review Process

It was performed.

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