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University Students' Knowledge, Consumption Patterns and Health Perceptions of Sugar Sweetened Beverages (SSB)

Rich S Warner and Marie-Ann Ha*

Faculty of Medical Sciences, Anglia Ruskin University, Cambridge, UK

***Corresponding Author**: Marie-Ann Ha, Faculty of Medical Sciences, Anglia Ruskin University, Cambridge, UK.

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Abstract

This study was conducted to find out if there was a direct link between knowledge of SSB, perceptions of risk or benefit and consumption of these beverages among university students. Additionally, the study sought to determine if these students viewed consumption of SSB as more of a risk or benefit to their health.

A validated, cross-sectional survey was employed, presenting questions relating to knowledge, perceptions of risks or benefit to health and consumption patterns of SSB. Visual aids of 6 different beverages formed part of the questions pertaining to knowledge of SSB. A sample of 250 students from 4 different courses was used. Analyses included descriptive statistics and t-test between percentages. Confidence interval (CI) of 95% was used with $p = 0.05$.

Most students had adequate knowledge of SSB (59.6%) and were consumers (73%). The difference between knowledge categories was not statistically significant in relation to not consuming SSB [$t(228) = 0.756$, $p = 0.4506$]. 77.4% registered concern about the sugar amounts in drinks, with most knowledgeable students viewing SSB consumption as more of a risk.

Knowledge of SSB is not directly correlated to consumption among university students. It is more important in risk perception and concern about SSB. Students view SSB as more of a health risk than as a benefit. The study supports the need for continued nutritional education for university students and further investigation on the role of taste in beverage selection.

Keywords: *Sugar Sweetened Beverages; Perceived Risks and Benefits; Taste; Consumption Patterns*

Introduction

Sugar and sugar sweetened beverage consumption has continued to increase globally despite recommendations from various health agencies [1]. In the UK intakes of sugars measured as non-milk extrinsic sugars from the 1990s to 2012 have consistently surpassed established guidelines [2]. Currently every age category within the country is exceeding the recommended daily added sugar intake with most of this added sugar originating from sugary beverage sources [3]. This increase in added sugar intake also contributes to higher health risks within the population. Added sugar has been implicated in increased risk of tooth decay, diabetes mellitus and even more so with increased weight gain. Given the prevalence of obesity within society today, many studies have been undertaken to prove the link between sugar consumption and obesity with one meta-analysis concluding that higher intake of sugary beverages were associated with higher body weight, greater energy intake, lower intake of other nutrients and worse health indices [4].

Presently not many studies have been conducted on the issue of sugary beverage consumption within the United Kingdom or the European Union. Scientific research is even more lacking within the young adult population. This study helps to fill that void. The study aimed to determine if there is a direct correlation between consumption patterns and knowledge (including perceived benefits or risks) concerning SSB amongst a group of university students at Anglia Ruskin University in Cambridge, UK.

Materials and Methods

The study was carried out using a quantitative approach and descriptive design aided by a cross-sectional survey instrument i.e. a paper questionnaire. In this study the researcher used the Anglia Ruskin University (Cambridge Campus) student body as the population. An appropriate sample size of 250 students was used after consultation with a statistician. The questionnaire used in the research incorporated the use of visual aids so that subjects understood the nature of the beverages referred to in the questionnaire. These visual aids included six beverages: a small (355 mls) sized can of coca cola, a small bottle of pasteurized whole milk (568 mls), a 240 mls bottle of minute maid orange juice, a can of red bull (250 mls), a small (330 mls) can of diet coke and a small bottle of mineral water (500 mls).

The variables of sex, age and the respondent's course were incorporated in the questionnaire. The questionnaire was designed to cover three main areas of focus, namely: the respondent's knowledge regarding sugar sweetened beverages (SSB), consumption patterns of SSB and the perceived views of the respondent regarding the health risks or benefits of consuming SSB. These 3 areas corresponded specifically to the studies research title. The questionnaire included 13 questions; after a pilot study was carried out to determine appropriateness, ease of understanding and to improve on response time. Two separate pilots were undertaken. Participants of these two pilot studies did not form part of the main study sample.

Participants were recruited by course. This was done to give insight as to whether or not a specific discipline being studied by students influenced their knowledge on the subject matter. Prior to commencing data collection different lecturers from various faculties were randomly sent letters of recruitment seeking permission to use their students as participants in the study. Four lecturers responded in a timely fashion and gave permission. Each lecturer presented the most acceptable time for the researcher to attend a scheduled class and carry out the survey. At each data collection session the researcher prepared the visual aids and placed them in front of the class each with a corresponding appropriate label and then gave a brief introduction about the search. Respondents were given a survey pack which included a participant information sheet (PIS), two participant consent forms (PCF) and the questionnaire to complete.

To enable a quantitative approach, the questions were given marks. Questions regarding the respondent's knowledge of the subject area (questions 1-4) were graded for correctness of answers. Percentage points were then calculated and respondent's attaining above 50% deemed to have adequate knowledge and those scoring 50% and below classified as having insufficient knowledge. Questions 5 through 10 identified consumption patterns and each questionnaire was classified as non-consumer, frequent consumer and infrequent consumer based on the responses offered.

Perceptions regarding risks and benefits (questions 11-13) were also identified and classified as perceived more as a risk, perceived more as a benefit and not certain. Correlations between the demographic variables used and responses as well as trends between the respondent's knowledge, consumption patterns and risk-benefit perception were also analysed. Statistical analysis used t-tests with a confidence interval of 95% was used with p-value of 0.05. Ethical approval was received from the Anglia Ruskin Faculty of Medical Science Ethics Committee.

Results

The initial population of respondents was 250 students. However, 20 questionnaires were deemed unusable by the researcher due to lack of pertinent information, multiple answers where unnecessary, as well as responses that were not intelligible. The following results were thus obtained from 230 answered questionnaires.

Demography

Most participants were between 18-20 years old (53%). Although the university has a significant number of adult students, in this study those students did not represent a majority. The smallest age category was represented by 5 persons over the age of 40 or 2.2%. 92.6% of participants were below 30 years. The majority of the participants were first year nursing students (52.6%).

Variable	Frequency	Percentage (%)
Sex of Respondent		
Male	105	45.7%
Female	125	54.3%
Age of Respondent		
18 - 20	122	53%
21 - 25	55	23.9%
> 25-30	36	15.7%
> 30 - 39	12	5.2%
> 40	5	2.2%
Student Cohorts		
Nursing	121	52.6%
Science Technology	35	15.2%
Sports Science	59	25.7%
Business Studies	15	6.5%

Table 1: *Demographic Variables of Respondents.*

Knowledge of Participants

	Frequency	Percentage (%)
Question 1		
Participants that selected the 3 correct answers.	77	33.5%
Participant selected 2 correct answers and excluded fruit juice.	45	19.6%
Participants selected 3 correct answers in addition to the non-caloric sweetened beverage.	89	38.7%
Selected only energy drink	1	0.4%
Participants viewed milk as a SSB	13	5.8%
Participant selected all options	5	2.2%
Question 2		
Participant mentioned correct sequence of beverages.	96	41.7%
Considered Energy Drink as having highest sugar content.	92	40%
Considered Fruit Juice as having highest sugar content.	38	16.5%
Viewed the non-caloric sweetened drink as having highest sugar content.	4	1.8%
Correctly placed milk before non-caloric sweetened drink.	125	54.3%
Placed non-caloric sweetened drink before milk	105	45.7%
Placed water as lowest sugar content.	230	100%

Table 2: *Frequency of major responses pertaining to participant's knowledge.*

Of the 96 respondents that identified the can of coke as having the highest sugar content, only 51 (53.1%) persons could identify the correct amount of sugar in the beverage. Of those that choose the energy drink as having the highest amount of sugar (92 people), only 36 (39.1%) could identify the sugar content. Four participants selected the non-caloric sweetened beverage as having the highest sugar.

The final question which examined knowledge (question 4) found a divergence of views on what the daily guideline for sugar intake is. Note this research was completed before the new recommendations were in place for the UK. 36% (83) of participants considered 5 teaspoons of sugar (25g) as the present daily guideline. 34 % (77) participants considered no more than 12 teaspoons (60g) of sugar daily was correct, 17% (39) participants selected the option as little as possible, whilst 11% (26) participants selected at least 20 teaspoons (100g). 2% (5 people) thought such a guideline was nonexistent.

The number of participants classified as having adequate knowledge was then calculated at 59.6% (137 participants). The t-statistic calculated was statistically significant, $p = 0.003$. The analysis of the data also showed that of the 105 male respondent 58 (55.2%) had adequate knowledge regarding SSB. Most of the 125 females of the study had adequate knowledge i.e. 79 respondents or 63.2%. One sample t-test showed that the difference in knowledge among males was not statistically significant [$p = 0.286$] whilst the difference among females was significant [$p = 0.003$].

Regarding age the analysis revealed that of the 17 respondents over the age of 30 years 16 or 94.1% had adequate knowledge and one (5.9%) respondent's knowledge deemed inadequate. This difference was significant statistically, $p < 0.001$. 121 of the 213 respondents under the age of 30 had adequate knowledge which translates to majority of 56.8%. A statistically significant difference for those under 30 regarding knowledge was not found, $p = 0.1337$.

Consumption among participants

Only 27 % (62 respondents) of the cohort did not drink SSB and were thus classified as non-consumers. Participants that selected they might consume 2 or more SSB daily were classified as frequent consumers (79 participants) and those that selected one SSB daily as infrequent consumers (89 participants). Most participants sourced SSB while on campus from nearby shops and supermarkets (45.2%). A 31% sourced these drinks from on-campus sources while smaller amounts of students brought these drinks from home or bought them at nearby restaurants. Only two respondents claimed no on-campus consumption. Soft drinks were identified as the most frequently consumed as mentioned by 72 consumers (42.9%) followed by energy drinks (19%) and in third place fruit juices (16.7%).

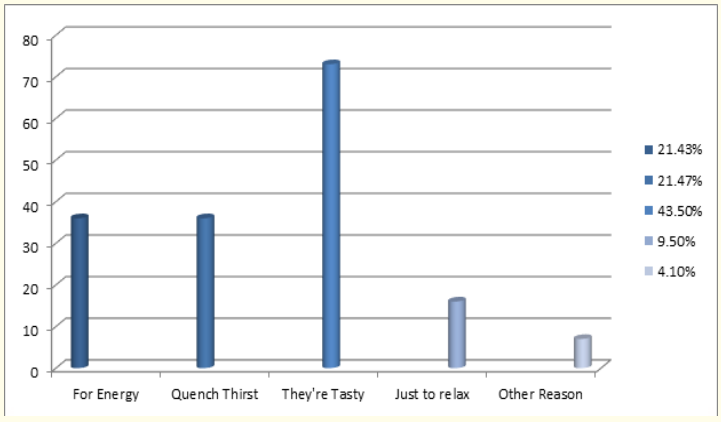

Figure 1: *Reasons for consumption and respective percentage of total consumers of SSB.*

Perceived risks or benefits

The results from this section showed that the majority of all respondents (178 respondents or 77.4%) were concerned about sugar content in drinks. From a demographic perspective, 84.8% of all females were concerned, while 68.6% of all men were concerned about the sugar content in drinks. A two sample t-test employed showed statistical significance between sexes regarding concern with $t(228) =$

2.926, p < 0.005. Those over the age of 30 all registered concern. From the 213 respondents under the age of 30, 75.6% registered concern. Age showed significant difference with t (228) = 2.315, p = 0.0215. On the other hand, 38 respondents (16.5%) considered SSB consumption as more beneficial to their health. More males (11.8%) perceived SSB as more beneficial while just 4.8% of females shared this view. Beneficial perceptions between the sexes was significant with t (228) = 1.950, p = 0.05.

The final question of the questionnaire yielded a myriad of single and multiple answers from respondents. These responses can be seen in table 3.

Perceived Benefits	Number of Respondents	Perceived Risks	Number of Respondents
Increase Energy.	21	Obesity or Weight Gain	72
Increases Efficiency.	1	Diabetes	89
Helps with alertness.	3	Sugar Addiction	5
Keeps you focused when studying.	11	Cardiovascular Issues	9
Kills bacteria in sore throats.	1	Tooth Decay	67
Benefits Muscle Synthesis	1	Skin Problems and Acne	17

Table 3: *Main Perceived risks and benefits of respondents.*

Knowledge and Consumption

The relationship between a respondent's knowledge and consumption patterns yielded different result. 35 respondents or 15.2% of the entire sample were identified as having adequate knowledge and not consuming SSB. Those with adequate knowledge and consumed SSB numbered 102 (44.4%). Of these, a majority of 54.9% were infrequent consumers.

A total of 27 (11.7%) were identified as having inadequate knowledge and not consuming SSB. The amount of respondents with inadequate knowledge and were consumers of SSB stood at 66 (28.7%). An equal number of those 66 respondents were identified as frequent and infrequent consumers respectively. A two sample t-test between percentages showed that the statistical difference those with adequate and inadequate knowledge in relation to not consuming SSB (abstaining) was not significant [t(228) = 0.756, p = 0.4506]. On the other hand, the same test administered in relation to consuming SSB showed statistical significance [t (228) = 3.926, p < 0.001].

Factoring in the variable of sex, it was shown that of the 58 males with adequate knowledge 75.9% were SSB consumers. Of the 47 males with inadequate knowledge 91.5% were also consumers. The majority of the 79 knowledgeable females (54.4%) abstained from consumption. Of the 46 females with inadequate knowledge only 1 (2.2%) did not consume SSB. The variable of sex in relation to those deemed knowledgeable and did not consume SSB showed statistical significance with t (135) = 3.555, p = 0.0005.

Knowledge and Perceptions of risk and benefit

Figure 2 show that the majority of respondents not withstanding knowledge considered SSB as more of a risk to their health. Of the 137 knowledgeable respondents, 85.4% considered SSB consumption more of a risk, 9.5% considered it more of a benefit and 5.1% were not sure. From the inadequate knowledge group, of the 93 respondents, 58.1% considered the consumption of these beverages as more of a risk, 26.9% selected more of a benefit and 15% were not sure. With respect to SSB being more of a risk, a statistically significant difference was found between both knowledge categories with t (228) = 4.653, p < 0.0001. Similarly, a statistically significant difference was found among the knowledge categories in relation to SSB being more beneficial to one's health with t (228) = 3.486, p = 0.0006. Those that were unsure in both groups also presented significant difference, t (228) = 2.562, p = 0.01.

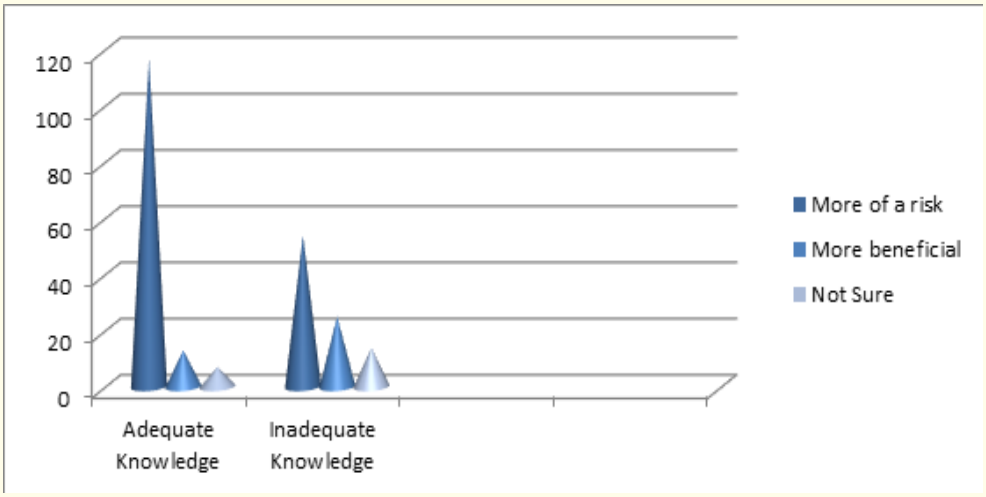

Figure 2: *Correlation between knowledge and perceptions of risk and benefit.*

Knowledge	Concern regarding sugar content in drinks
Adequate Knowledge (137)	Concerned 118 (86.1%)
	Not Concerned 19 (13.9%)
Inadequate Knowledge (93)	Concerned 60 (64.5%)
	Not Concerned 33 (35.5%)

Table 4: *Relation between knowledge and concern regarding sugar content in drinks.*

The table above shows most respondents regardless of knowledge level viewed sugar content of drinks as a concern with those having adequate knowledge showing greater concern (86.1%) when compared to those with inadequate knowledge on the issue (64.5%), statistically significant with t (228) = 3.842 and p =< 0.001. Those with inadequate knowledge were more not concerned (35.5%) compared to 13.9% of those with adequate knowledge.

Discussion

The study provides evidence that a statistically significant majority of students have sufficient knowledge regarding sugar intake and content of sugar sweetened beverages. This finding is similar to other studies conducted at other universities around the globe such as a study conducted among undergraduates at a Nigerian university which also found the knowledge of those students to be adequate [5]. Although there were 180 participants studying subjects where some knowledge of food and nutrition would be central (Sports Science and Nursing Courses), the results did not show that all these participants had sufficient knowledge. In India, a study conducted among aspiring medical doctors yielded results which concluded a lack of adequate knowledge of SSB [6]. Within the UK, work conducted among medical students also found a lack of nutritional knowledge [7]. There is therefore a need to incorporate food and nutrition content into the curricula of students studying health science courses. A more rigorous nutritional survey perhaps would yield far more detailed results on student's knowledge.

In this study whilst more females had adequate knowledgeable than males, the difference was not statistically significant. Sex had no impact on how knowledgeable a participant was regarding SSB and goes against the view expressed by Idler (2003) [8] which suggest that women are generally more knowledgeable about health matters than their male counterparts. The study also goes contrary to the

University of Arkansas research by Huffman and Wes (2007) [9] which showed females to be more knowledgeable than males regarding this issue. The variable of age showed that older participants were more knowledgeable than younger ones. Though only 17 persons were placed in the 'over 30' category, the results were still statistically significant and lends some insight as to why it is suggested that older persons are less likely to present optimistic bias [10].

Whilst most persons identified the sequence of drinks correctly, it was still the view of a large number of students to place the energy drink as number 1 i.e. having the highest sugar content. The (355 mls) can of coca cola contained 39 gramms of added sugar while the energy drink used (250 mls can of Redbull) contained 27 gramms. A smaller number viewed the fruit juice drink (Minutemaid, 240 mls bottle) containing 24 gramms as the drink with the highest added sugar content. Most students could not properly estimate the amount of sugar in these drinks. This phenomenon is commonly observed in the United Kingdom where consumers have difficulty differentiating between healthy and unhealthy drinks and sugar content [11].

Of interest also was the number of students that considered the non-caloric sweetened drink (330 mls can of diet coke) as a SSB. The view of a non-caloric sweetened drink being classified as a sweetened beverage may prove puzzling to some as these beverages are sugar free and viewed by some as having health benefits such as reducing weight gain [12]. However, it is theorised that persons tend to classify things into groups based on common characteristics [13]. In this case all carbonated drinks regardless of containing sweeteners or added sugar were grouped together, incorrectly.

A large number of students were unaware of the correct amount of sugar they should consume on a daily basis. This was evidenced by the lack of a statistically significant difference between the majorities selecting the option of just 5 teaspoons daily as opposed to the correct answer of no more than 12 teaspoons daily. While a statistically significant number of students still managed to exhibit an adequate knowledge level scoring above 50% suggesting people are aware of sugar intake, greater work needs to be done to promote what healthy sugar intake really is as this work was done prior to new, more stringent recommendations coming in [3]. The government should be actively promoting the new recommendations to be able to actively tackle the obesity epidemic. One of the reasons behind the lower suggested intake is that, there is more than adequate evidence showing a high intake of sugar is significantly related to increased obesity [14].

The aspects of the study which dealt with the consumption of SSB revealed that most students were in fact consumers. Studies conducted in both Nigeria and India presented similar findings among university students [5,6]. The National Diet and Nutrition Survey rolling programme from 2008 - 2012 [2] also supports these findings as it shows that most UK adolescents and young adults acquire most of their daily added sugars from sugary drinks [3]. The main supply of SSB while students were on campus was not from campus sources as one would assume but rather from nearby shops and supermarkets. The exact reason for this was not investigated, however it can be posited that shops and supermarkets offer larger varieties of beverages at more affordable cost.

Similar studies carried out at high schools tend to support this view that most unhealthy foods are now generally sourced from off campus sites [15]. Block., *et al*. (2012) [16] notes that preference and affordability are most important during beverage selection. Most consumers in this study showed a preference for soft drinks, i.e. sodas, with the carbonated drink of choice being a can of coca cola.

The determinant of taste as outlined by the European Food Information Council (2005) [17] was identified by most students as their reason for consumption (Figure 1). This single determinant could also explain frequency of consumption among university students as well as a reason for persons viewing these drinks in a positive light. This determinant may also pose as a barrier during the education process of consumers concerning the importance of reducing SSB intake. Further investigations on sweetness impact should be done to better understand the role of taste in food selection.

Perception within the study focused on health concerns of SSB consumption and the perceived risks or benefits towards these drinks. Most participants were indeed concerned. Contrary to what was expressed regarding influence of a person's sex on knowledge in this study, female students showed significantly more concern than their male counterparts while age had no statistical significant impact

even though a large quantity of those over 30 years old did register concern. The lack of significance can be attributed to the small size of participants over 30. Importantly, perceptions of risk were not influenced by sex nor age category, evidenced by the significantly large amount of participants viewing SSB as more of a risk. These findings tend to go against the view of age and sex being important in determining perceptions of health risk by von Bothmer and Fridlund (2005) [18] as well as Bränström and Branberg (2010) [10] findings of age in relation to risk and optimistic bias. It must be mentioned also that an 'educational bias' exists within the study as all participants are educated or in the process of obtaining tertiary education. This could suggest that level of education is more important than the variables of sex and age.

Males were found to be more likely to view SSB as more of a health benefit. This does not imply that males are not as knowledgeable as females. One can posit that from a sociological perspective males tend to be more active and into fitness and exercise, consuming these beverages for energy purposes and thus viewing SSB in a more favorable light. The vast majority of males who held positive views of SSB were studying Sports Science. These participants seemed to base their views mainly on the importance of sugar as an energy source when asked to mention a benefit. Whilst sugar is needed for energy, the weight of evidence showing an association between added sugar consumption and health risks cannot be overlooked [19]. The main perceived risks were identified as obesity, diabetes and tooth decay. Numerous studies exist which show a relationship between SSB consumption and the risks identified. Smaller number of students identified risks such as cancer, digestive problems, and increased cholesterol among others. Presently studies are ongoing to substantiate some of these claims [19]. Examining how knowledge influenced perception it was observed that the more knowledgeable a respondent was the more likely they were to register perceptions of risk indicating that Knowledge of SSB influences perception of risk and benefit. The study found no significant statistically relationship between nutritional knowledge of SSB and consumption supporting the notion that knowledge perhaps is not the most important factor influencing sugary drink consumption among university students. Other determinants of food selection as expressed by the European Food Information Council (2005) [17] would need to be studied to better understand the main drivers of sugary beverage consumption amongst this particular group of persons to further understand why individuals having sufficient knowledge of SSB would still consume said beverages.

Whilst knowledge was not affected by the sex of the participant, it was observed that females of adequate knowledge were more likely not to consume SSB [$t(135) = 3.555$, $p < 0.001$] when compared to their male counterparts. This suggests that females are more likely to positively use the knowledge they have when selecting a beverage for consumption. The variable of age showed older students being more knowledgeable; however SSB consumption from an age perspective was not tabulated. Therefore, the researcher cannot state what impact age would have had on the knowledge-consumption dynamic.

Further investigation is needed placing more emphasis on taste (palatability), preference, sweetness impact, satiety and other biological determinants of food choices in addition to continued education campaigns in order to reduce the amount of SSB and added sugars being consumed by the UK populace. An increase in the use of behavioural economics to effectively influence consumer choice (especially when it comes to selling healthier or reformulated foods) will also assist in any effort of reducing added sugar consumption. In this regard, one must also incorporate health policies linking food, nutrition and society as well as holding industry partners more responsible for the type of products being placed on the market for consumption.

Conclusion

Knowledge of SSB does not have any direct influence on consumption among university students. Taste however, plays a major role in beverage selection. Knowledge is more important in risk perception and concern about SSB. Most students view SSB as more of a health risk than as a benefit.

Author's Contribution

RW collected the data, analysed, interpreted and wrote the manuscript. The authors together designed the study, interpreted the data and contributed to writing and critically reviewing the manuscript submitted for publication.

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