

Full Length Research Paper

Screening for Liver and Colorectal Cancer among Automobile Mechanics in Ibadan North-East local Government Area, South-West Nigeria

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Abstract

The study documents the level of Alpha-fetoprotein (AFP) and Carcinoembryonic Antigen (CEA) among selected automobile mechanics within Ibadan metropolis with the aim to improve uptake of cancer screening. A cross-sectional design was adopted and fifty consented automobile mechanics in Ibadan North-East LGA within Ibadan metropolis participated in the study. Consenting automobile mechanics were interviewed using a validated semi-structured questionnaire. Venous blood sample (5 ml) collected from participant was analysed for AFP and CEA using standard procedure. Age of the respondents was 45.1 ± 6.5 years (range = 40 - 45 years). Most 88.0% were married, 98.0% had completed primary education while 66.0% had spent more than 10 years in the practice. Only 2.0% of the respondents were obese, 24.0% reported they have ever had cancer screening while 42.0% stated that they had family member suffered from cancer. Alpha-fetoprotein (AFP) and Carcinoembryonic Antigen (CEA) level were 4.6 ± 3.1 , (range = 1.5 to 18) and 1.9 ± 1.2 , (range = 1.0 to 5.5) respectively. Four per cent had AFP values above the normal range (0-10ku/L) while none of the participants had abnormal CEA. Automobile mechanics who had ever smoked had high AFP (6.3 ± 4.2) compared to those who had never smoked ($t=2.555$, $p=0.014$). Very few automobile mechanics had ever gone for cancer screening and several reported that they had family member suffered from cancer. Periodic cancer screening is recommended for self-employed population including automobile mechanics.

Keyword: Automobile mechanics, Alpha-fetoprotein, Carcinoembryonic Antigen

Introduction

Cancer can be regarded as a group of diseases characterized by abnormal growth of cells, able to invade adjacent tissues and even distant organs (Park, 1997). The growth of malignant tumors usually destroys surrounding tissues, induces increased blood vessels formation to supply nutrients to the multiplying cancer cells, and eventually may spread to distant tissues (metastasis). Cancer is widely perceived to be a disease of industrialized nations, but the emerging facts show that the majority of deaths from cancer occur in the developing world. Ferlay et al., (2008) estimated that about 1,234,000 new colorectal cancer were diagnosed in the world with less than 60% from developed countries. Screening had been identified as one of the effective ways of preventing colorectal cancer. Hewitson et al., (2008) documented that about 15% to 25% of colorectal cancer deaths can be prevented by screening. Indeed, cancer screening could prove to be beneficial in terms of reducing the incidence of cancer as well as mortality especially among at risk population. Several studies have suggested that colorectal cancer screening could improve early detection and prompt resumption of treatment and eventually reduces mortality from colorectal cancer (Maxwell, 1999; Molina et al., 2003). However, attempts to detect malignance within population who are without the sign and symptoms of the tumor could be challenging. Regrettably, many people from different occupational and environmental settings, and within the myriad of population are living with one cancer episode or the other without noticing. Sometimes they will be diagnosed with late stage cancer when they seek medical care for any ailment cases other than cancer, and therefore do not receive effective cancer treatment (Xin et al, 2013).

Notwithstanding, the detection of tumors without any early signs involves more sophisticated procedure which is extremely difficult (Xin et al, 2013). Moreover, there are some kinds of discomfort associated with the techniques involved in the final diagnosis-collecting tissues for biopsy and this could not be appropriate for screening. This might be a main contributing factor for people to undergo screening rather than patient who has no alternative other than to undergo cancer test. As a result, numbers of tumor markers have been identified and emphasis placed on their role in assisting with screening and diagnosing tumors (Virji et al., 1988; Kluger et al., 2011). Carcinoembryonic antigen (CEA) has been identified and developed as one of diagnostic biomarkers for over 40 years (Maxwell, 1999). It has also been suggested as useful tool in the screening and diagnosis of cancer (Molina, 2003). Moreover, the α -fetoprotein (AFP) marker has been used mainly to detect gastrointestinal and hepatic cancer (Bates and Longo, 1987).

There are several individual as well as environmental risk factors that are associated with the incidence of cancer. Colon cancer most commonly occurs sporadically and is estimated to be inherited in 5%-15% of cases (Papadopoulos et al., 1994; Jackson-Thompson et al., 2006). Studies have attributed occurrence of colorectal cancer to cigarette smoking, alcohol consumption (Shike et al., 1990; Giovannucci and Martínez, 1996) and family history (National Research Council, 1982; Shike et al., 1990), and revealed to increase risks of the tumor. Colorectal cancer has been reported as other tumors (Oddone et al., 2013; Saberi et al., 2013) or chronic degenerative diseases (Oddone et al., 2013), but not commonly considered to be occupational in etiology. However, studies have documented its increased risks among workers in some occupational settings such as the textile industry (Andersen et al., 1999; Mastrangelo et al., 2002) and automobile industry (Hoar et al., 1985; Tilley et al., 1990). Similar reports have been documented among subjects exposed to wood dust (Dement et al., 2003) and organic solvents (Anttila et al., 1998; Dumas et al., 2000).

In Nigeria, like other developing countries there is lack of information on the awareness of the contributions of environmental cum occupational factors to various cancer occurrences. In addition, accessibility to facilities for early diagnosis are limited hence could lead to increased rates of mortality from cancers of various causes. If the present situation continues, it is predicted that the incidence of colorectal cancer will rise in Nigeria, as a result of changes in lifestyle and exposure to various environmental cum occupational conditions. Without doubt, People in different occupational settings are exposed to various environmental and occupational problems yet were unaware of colorectal cancer screening. Hence, the study documents the level of Alpha-fetoprotein and Carcinoembryonic Antigen among selected automobile mechanics within Ibadan metropolis with the aim to improve uptake of cancer screening.

Materials and methods

Study Area and location

This study was carried out among automobile mechanics in Ibadan North-East local government Area within Ibadan Metropolis, Oyo state, Nigeria. Ibadan is one of the largest cities in Africa and the capital of Oyo state. The city has 11 local government administrative areas, five within the metropolis and six peripherals with a mix of urban, semi-urban and rural communities. Ibadan has coordinates of $7^{\circ} 23'0''\text{N}$, $3^{\circ} 56'0''\text{E}$ and located near the forest-grassland boundary of Southwest area of Nigeria. The population of central Ibadan with its five local government areas is 1,338,659 while Ibadan city with 11 local government areas has a population of 2,550,593 (Federal Republic of Nigeria, 2009). Ibadan is the center of Yoruba culture and tradition. The city has best described to consist of an inner core or (High density), a traditional area (Medium density) and a peripheral (Low density) area. The inner-core comprises the old town that exhibit an unplanned development and population density of about 350-450 persons per hectare, whereas, the outer area has well planned housing states and population density varies from 75-300 person per hectare (Adewale and Ladejo, 1986). The climate is characterized by a raining season from March through October, while the dry season stretches from November to February. In addition, about 36.25sq.km (34.9% of the land area) is devoted to land use (such as residential area, public buildings and facilities, markets, industrial and commercial areas as well as educational institutions, social amenities and open spaces). The remaining 63.75sqkm is devoted to non urban uses such as forest reserves, farm lands and aquatic environment (Areola, 1992).

Study design and Study Location

The study adopted a cross-sectional design and 50 consented automobile mechanics in Ibadan North-East LGA within Ibadan metropolis participated in the study. Only those who had received certificate and practicing after undergone Apprenticeship (referred locally as Master) were included. The study included those aged at least 40 years and have spent at least three years in the practice to guarantee adequate exposure to the work place environmental pollutants. A set of validated semi structured questionnaire was used to elicit socio-demographic characteristics of the mechanics, lifestyle and personal/family history with colorectal cancer. Blood samples were also collected from automobile mechanics and analyzed for two different tumour markers-Alpha-fetoprotein (AFP) for liver cancer and Carcinoembryonic antigen (CEA) for colorectal cancer using a standardized laboratory procedure.

Study population and Sampling Techniques

A 2-stage cluster sampling techniques was used to select Local Government Areas (Ibadan North-East) within Ibadan Metropolis and mechanic workshops. Fifty consented automobile mechanics aged at least 40 years, received certificate and spent at least five years in the practice in each of the selected shops were selected to participate in the study. The researchers had approached the authorities' in-charge of the selected mechanic workshop particularly the Zonal Association executive and the head of the mechanic workshop before the commencement of data collection with formal letters to obtain permission to carry out the work in the workshop and also explained the study objectives. Also, a meeting was held with all the mechanic workshop members working within the selected LGAs to discuss the theme and objectives of the study. This is crucial in ensuring that they understood all aspects of the study and could individually take informed consent. In addition, a health education talk on the probable relationship of environment, lifestyle and the development of the cancer was given. Following the health talk, all subjects who agreed to be screened for colorectal cancer were selected to participate in the study. The association executives and head of the mechanic workshops granted permission and nominated 2 people to supervise the collection of blood samples from their members. Consent forms after they had been completed and signed, were obtained from Automobile Association authority in the LGA, head of the automobile mechanic workshop and the individual automobile mechanic. Consenting automobile mechanics were interviewed using a validated semi-structured questionnaire while

blood samples were collected immediately after the interview from the respondents. Also, respondents' height and weight were measured using a calibrated meter rule and weighing balance respectively. Interviews were conducted by two trained research assistants (male) who are university graduates and were conversant with questionnaire research. They were trained in how to use the instrument and how they should introduce themselves and the research objectives modestly to the automobile mechanics during the interview.

Laboratory Analysis

Serological Assay Using Immunoradiometric Method (IRMA)

Venous blood sample (5 ml) was collected from each participant using a hypodermic syringe with the help of a trained laboratory scientist. The serum obtained was stored at -4°C until analysis was carried out while the Immunoradiometric assay (IRMA) method described by NETRIA Company was used for the analysis. The reagents used were supplied in bulk by NETRIA of ST Barthons College of medicine. The reagents were prepared using standard methods while the sample collector observed safety measures such as the change of gloves, and needle and syringe with each mechanic during sample collection.

Procedure for the IRMA

The required test tubes (size 75 x 12mm) were labeled and arranged in duplicates in a test tube rack for standards quality control and test samples. Carcinoembryonic antigen (CEA) was used as the marker, $100\mu\text{g/l}$ each of the standards, quality control and test samples were added to the corresponding labeled tubes. Subsequently, $200\mu\text{g/l}$ each of the IRMA assay buffer was added to all the tubes. Then, the tubes were mixed thoroughly using vortex and the coated beads were added to each tube. The specimens were rotated while the coated were washed using an aspirator with 2 ml of a wash buffer twice. The corresponding tracers (radioactive materials) were added to each test tube at a volume of $200\mu\text{g/l}$. The tubes were further rotated for another 2 hours after which the beads were washed again using the wash buffer. The washed beads were then transferred to counting bottles and 4 ml of scintillating fluid was added to each bottle, counting was done for 100 seconds on BeckmLD analyzer. The average counts obtained from each pair of the standard test samples and controls were expressed as a fraction of the total count. A standards curve was plotted (i.e. counts per minute of the standard versus the concentration of the standards), then the concentrations of the test samples and quality control were then extrapolated from the graph.

Data Analysis

Data generated from the field and laboratory was edited daily. Then they were coded and entered into the computer for analyses using the SPSS Windows Version 20 statistical software package. Data were presented as mean, standard deviation for continuous variables and percentages for categorical variable. Body Mass Index (BMI) was computed based on the height and weight measurement and categorized into Normal, overweight and obese. T-test (2 tailed) and Analysis of Variance (ANOVA) statistic was used to determine the difference between demographic characteristics, respondent's lifestyle, AFP and CEA level. Spearman correlation was used to predict relations between age, years in practice, and AFP and CEA level at $p=0.05$.

Ethical Consideration

Ethical approval was obtained from the joint Ethical committee of University of Ibadan and University College Hospital, Ibadan, Nigeria before the commencement of the field work. Further, consent was obtained from Automobile Association authority of the Local Government areas where the study was carried out. Informed consent of the Head of the automobile mechanic workshop and the individual automobile mechanics were sought prior to the conduct of the interview as well as blood sample collection.

Results

Demographic profile of the respondents

Demographic profile of the participants is presented in Table 1. The mean age which ranged from 40 - 45 years was 45.1 ± 6.5 years. Most 44 (88.0%) were married and 4 (8.0%) were single. Forty-nine (98.0%) had completed primary education while 2.0% had completed secondary education. More than half (54.0%) practiced Islam and 42.0% were Christians. Majority (66.0%) had being in the practice for more than 10 years, 6.0% had been practicing in less than 5 years while 60.0% lived in medium density area within the LGA.

Lifestyle, reported cancer history and levels of AFP and CEA

Table 2 presents the lifestyle and reported cancer history of the participants. It was found that equal proportion (28.0%) reported that they had ever smoked cigarette and drank alcoholic beverages respectively. Majority 68.0% of the participants had normal BMI, 14 (28.0%) were overweight while 2 (4.0%) were obese. More than one-fifth (24.0%) stated they have ever had cancer screening while 21 (42.0%) reported that they had family member suffered from cancer. The mean Alpha-fetoprotein (AFP) and Carcinoembryonic Antigen (CEA) were 4.6 ± 3.1 , (range = 1.5 to 18) and 1.9 ± 1.2 , (range = 1.0 to 5.5) respectively. Only 2 (4.0%) had AFP values above the normal range (0-10ku/L) as shown in Figure 1. Also, none (0.0%) of the participants had abnormal CEA (Figure 1 for detail), the values were below the normal range (0-8ug/L).

Table 1: Demographic profile

Demographic profile	Number (N=50)	%
Age		
< 50 years	40	80.0
≥ 50 years	10	20.0
Mean±SD = 45.0±6.5; Minimum=40, Maximum= 65		
Marital status		
Single	4	8.0
Married	44	88.0
Separated	2	4.0
Level of Education		
Primary School	49	98.0
Secondary School	1	2.0
Religion		
Christianity	21	42.0
Islam	27	54.0
Traditional	2	4.0
Years in Practice		
< 5 years	3	6.0
5-10 Years	14	28.0
>10 years	33	66.0
Housing area		
Low density	11	22.0
Medium density	30	60.0
High density	09	18.0

Table 2: Lifestyle, reported cancer history and levels of AFP and CEA

Lifestyle and reported cancer history	Number (N=50)	%
Lifestyle		
Ever smoked		
Yes	14	28.0
No	36	72.0
Ever drink alcohol		
Yes	14	28.0
No	36	72.0
BMI		
Normal	34	68.0
Overweight	14	28.0
Obese	2	4.0
Reported cancer history		
Ever had cancer screening	12	24.0
Had family or any family member suffered from cancer	21	42.0

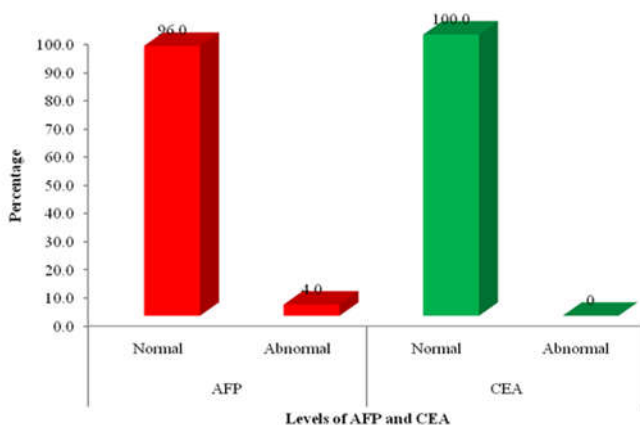


Fig 1: Level of AFP and CEA

Mean±SD = 4.6±3.1, Minimum=1.5, Maximum = 18 (AFP); 1.9±1.2, Minimum=1.0, Maximum = 5.5 (CEA)

Factors associated with the level of AFP and CEA

Level of AFP and CEA were compared with respondents' characteristics and lifestyle and reported cancer history as revealed in **Tables 3 and 4**, respectively. Respondents' age group did not show any significant difference in levels of AFP likewise the marital status. Automobile mechanics who had spent between 5-10 years in practice had high AFP (6.5 ± 4.1) compared to those who had spent <5 years and >10 years in practice ($t = 3.714$, $p = 0.032$). Also, Automobile mechanics who had ever smoked had high AFP (6.3 ± 4.2) compared to those who had never smoked ($t = 2.555$, $p = 0.014$). No significant differences existed between ever drink, reported cancer history and level of AFP. However, Respondents' age group did not show any significant difference in levels of CEA likewise the marital status and the participant's years in the practice. Moreover, there is no significant differences between ever drink, reported cancer history and level of CEA. As shown in Table 5, there was a positive correlation between respondents age and the number of years in the practice ($r = 0.335$, $p < 0.05$) indicating that older automobile mechanics had spent more years in practice compared to the younger ones. The number of years participants has spent in practice was positively correlated with the level of CEA ($r = 0.310$, $p < 0.05$). On the other hand, there was no significant correlation between number of years in the practice and the level of AFP. This indicated that level of AFP in the participants may not be associated with number of years respondents had spent in practice.

Table 3: Factors associated with the level of AFP (N = 50)

Characteristics	Number	Mean±SD (Level of AFP)	F/t test	p-Value
Age				
< 50 years	40	4.7±3.2	0.014	0.908
≥ 50 years	10	4.5±2.7		
Marital status				
Single	4	4.3±2.1	1.057	0.356
Married	44	4.5±3.2		
Separated	2	7.8±3.1		
Years in Practice				
< 5 years	3	4.1±2.5	3.714	0.032
5-10 Years	14	6.5±4.1		
>10 years	33	3.9±2.3		
Ever smoked				
Yes	14	6.3±4.2	2.555	0.014
No	36	3.9±2.2		
Ever drink				
Yes	14	3.5±2.1	1.638	0.108
No	36	5.1±3.3		
Ever had cancer screening				
Yes	13	5.3±4.6	0.897	0.374
No	37	4.4±2.4		
Had family or family member suffered from cancer				
Yes	21	5.2±3.1	1.286	0.205
No	29	4.1±3.0		

Table 4: Factors associated with the level of CEA (N = 50)

Characteristics	Number	Mean±SD (Level of AFP)	F/t test	p-Value
Age				
< 50 years	40	2.1±1.2	2.347	0.132
≥ 50 years	10	1.4±0.9		
Marital status				
Single	4	1.2±0.4	0.704	0.500
Married	44	1.9±1.2		
Separated	2	2.0±1.4		
Years in Practice				
< 5 years	3	1.3±0.5	2.512	0.092
5-10 Years	14	1.4±0.9		
>10 years	33	2.2±1.3		
Ever smoked				
Yes	14	1.5±0.9	1.597	0.117
No	36	2.1±1.3		
Ever drink				

Yes	14	1.8±1.3	0.187	0.852
No	36	1.9±1.1		
Ever had cancer screening				
Yes	13	1.8±1.4	0.399	0.691
No	37	2.0±1.1		
Had family or family member suffered from cancer				
Yes	21	1.8±1.1	0.551	0.584
No	29	2.1±1.2		

Table 5: Correlation matrix of the predictor of level of Alpha-fetoprotein (AFP) and Carcinoembryonic Antigen (CEA)

Variables	Age	Years in practice	AFP	CEA
Age	1			
Years in practice	0.335*	1		
AFP	-0.079	0.254	1	
CEA	-0.235	0.310*	-0.176	1

*. Correlation is significant at the 0.05 level (2-tailed).

Discussion

The present study documents the level of Alpha-fetoprotein (AFP) and Carcinoembryonic Antigen (CEA) among automobile mechanics in selected Local Government Area within Ibadan Metropolis with the aim to improve uptake of cancer screening. Data revealed that majority of the automobile mechanics were below the age of 50 years. In addition, they had being in the practice for more than 10 years while large proportion lived in medium density area within the LGA.

Screening uptake could be attributed to Lifestyle and health factors. For instance, current smoking habit was associated with poor colorectal cancer screening adherence while screening rates increases among former smokers (Hsia et al., 2000; Ioannou et al., 2003). This study observed that low percentage (28.0%) reported they had ever smoked cigarette and drank alcoholic beverages respectively. Though the proportion is low but there is need for adequate and timely educational intervention on way to reduce the practice of these risky lifestyles. The occurrence of colorectal cancer have been attributed to cigarette smoking, alcohol consumption (Shike et al., 1990; Giovannucci and Martínez, 1996) and family history (National Research Council, 1982; Shike et al., 1990) and revealed to increase risks of the tumor.

Moreover, studies have reported low proportion of colorectal cancer screening practices by body mass index (Rosen and Schneider, 2004) especially in developed countries. In this present study however, only 28.0% were overweight while 4.0% were obese. None of the participants in these categories of body mass index had ever uptake neither colorectal nor liver cancer screening. In addition, they were neither aware nor knowledgeable about this condition-being overweight or obese as a risk factor.

Several participants reported having family member suffered from cancer. Having family member suffered from cancer had been attributed to the uptake of cancer screening but it has never spur the participants in this present study to uptake any cancer screening. This findings, however contradicts several studies that have suggested that individuals with a family history of colorectal cancer are more likely to engage in screening than the average-risk population (Subramanian et al., 2004; Rees et al., 2008). Notwithstanding, it is essential to note that most of the studies cited were conducted in developed nation. Moreover, this study revealed that a small proportion have ever had cancer screening. This is similar to the findings of several studies (Joseph et al., 2012; Swan et al., 2010) that despite the efficacy of colorectal cancer screening in reducing incidence and mortality rates, its screening uptake remains behind that of other screening-amenable cancers and rates continue to be low worldwide.

Evidently, lack of knowledge about colorectal cancer was common across groups and has been attributed to the low in public awareness, which has negatively affected some development of a colorectal cancer screening program (McVeigh et al., 2013). This lack of knowledge was mostly linked to fear of diagnosis, invasiveness, and failure to consider religious sensitivities (Ahmad et al., 2015). Moreover, workplace screening has also been reported to effectively increase CRC awareness and promote screening (Bagai et al., 2007) especially among occupational group who were neither aware nor uptake CRC screening. In this study, very low proportion of automobile mechanics consented to participate in the study, the level of Carcinoembryonic Antigen and Alpha-fetoprotein was low. The maximum value for the CEA among the respondents is 5.5ug/L and all had CEA values below the normal range (0-8ug/L). Though this revealed that the study population were not living with cancer, it might be attributed to their age-below 50 years and also the small population that consented to take part in the study. However, this study found that only 4.0% had abnormal Alpha-fetoprotein (AFP) level, a value above the recommended limit of 10ku/L. The low proportion might be as a result of the average age of the participants which is below 50 years. Several studies have documented incidence of colorectal cancer with certain age

categories. The likelihood increase of colorectal cancer have been diagnosed after the age of 40, which rises sharply after age 50 (Rees et al., 2008).

Also, colorectal cancer incidence rate has been reported to be more than 50 times higher in persons aged 60 to 79 years than in those younger than 40 years (Ries et al., 2008; American Cancer Society, 2005). Nevertheless, there was an observed increase in colorectal cancer cases among younger persons, especially men and women aged 20 to 49 years (O'Connell et al., 2003; 2004; Fairley et al., 2006). Moreover, the study found that respondents' age did not show any significant difference in levels of AFP and CEA likewise the marital status. Automobile mechanics who had spent between 5-10 years in practice had high AFP compared to others. Also, Automobile mechanics who had ever smoked had high AFP compared to those who had never smoked. The study did not observe any significant differences between reported cancer history and level of AFP. This indicated that reported cancer history of the respondents had no influence on the level of AFP.

Several studies reported that high proportion of older men above the age of 50 years uptake colorectal screening (Brenner et al., 2009; Zorzi et al., 2007; Thrasher et al., 2002). In this study, reported cancer history and level of CEA were not related. However, respondent's age group did not show any significant difference in levels of CEA likewise the marital status and the participant's years in the practice. Nevertheless, a significant positive correlation existed between the number of years participants has spent in practice and the level of CEA. This findings is an indication that automobile mechanic who had spent more years in practice had high CEA level compared to the younger ones. On the other hand, there was no significant correlation between number of years in the practice and the level of AFP. This indicated that level of AFP in the participants may not be associated with number of years respondents had spent in practice.

Conclusion

Level of Alpha-fetoprotein (AFP) and Carcinoembryonic Antigen (CEA) among automobile mechanics were investigated in Ibadan North East Local Government Area within Ibadan Metropolis. Only 4.0% had AFP level that exceeded the recommended limit while CEA level of all the participant was below the recommended limit. Very few automobile mechanics had ever gone for cancer screening and several reported that they had history of family member suffered from cancer. Though the CEA level was below the recommended limit, number of year automobile mechanics has spent in practice predicted increase in CEA level compared to age. Periodic cancer screening is recommended for self-employed population including automobile mechanics.

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