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ABSTRACT

Background: The prevalence of diabetes mellitus is rising in Nigeria and its complications present an immense public health burden.

Objective(s): The objective of this discourse is to review the state of diabetes care in Nigeria with focus on the needs, priorities and recommendations, which should guide our clinicians. It will discuss the definition, pattern, landmark Nigerian studies on diabetes care, matters arising, morbidity/mortality and proposed strategies for improving diabetes care in Nigeria.

Methods (Data Sources/extraction): The data search used in this review covered studies published from 1959-2010, obtained from prevalence studies, hospital statistics, registry reports, landmark hospital-based studies, recent international conference proceedings, world health reports, government estimates, United Nations resolutions on diabetes, international diabetes federation (IDF) declarations and clinical practice guidelines.

The medline database, the internet (e-medicine, medscape resource etc), journal articles, World Health and international diabetes federation (IDF) monographs were used.

Results: The rising prevalence of diabetes as well as its associated morbidity / mortality, preventive measures and effective treatments are well recognized. However, in practice this knowledge is under- utilized because only about a third of Nigerians living with diabetes achieve optimum targets (glycaemic control, blood pressure, lipids and weight).

Conclusion: Most Nigerians living with diabetes have suboptimal control, are hypertensives and have chronic complications. Improved quality of care and treatment-to-target is recommended to reduce diabetes-related morbidity and mortality.

Keywords: State, diabetes care, recommendations, NCDs, United Nations.

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INTRODUCTION

Diabetes mellitus is the commonest endocrine-metabolic disorder characterized by chronic hyperglycaemia giving rise to the risk of microvascular (retinopathy, nephropathy, and neuropathy) and macrovascular (ischaemic heart disease, stroke and peripheral vascular disease) damage¹, with associated reduced life expectancy and diminished quality of life.

Recent estimates indicate there were 171 million people in the world with diabetes in the year 2000 and this is projected to increase to 366 million by 2030.¹ This increase in prevalence is expected to be more in the Middle Eastern crescent, Sub-Saharan Africa and India¹.

In Africa, the estimated prevalence of diabetes is 1% in rural areas, up to 7% in urban sub-Sahara Africa, and between 8-13% in more developed areas such as South Africa and in population of Indian origin.²

The prevalence in Nigeria varies from 0.65% in rural Mangu (North) to 11% in urban Lagos (South)³ and data from the World Health Organization (WHO) suggests that Nigeria has the greatest number of people living with diabetes in Africa.¹

REVIEW OF SOME NIGERIAN STUDIES

Cobban was one of the first to remark on the relative rarity of diabetes in UCH, Ibadan in the 1950s.⁴

[1997 National NCD survey:] Akinkugbe et al³ in their National survey of Non-communicable diseases in Nigeria (1997) documented the national prevalence of diabetes (age-adjusted) to be 2.2% with male: female ratio of 1:1.1 and a significant increase in prevalence with age. Thus below the age of 45 years, crude prevalence in males was 1.6% and 1.9% in females, rising to 5.4% in males and 5.6% in females after the age of 45years reflecting a threefold increase in each gender. The same survey estimated that not less than 1.05% million Nigerians were likely to be diabetic with only about 225,000 being aware of their condition and about 198,000 receiving treatment. The above figures were most probably higher because Nigerians below the age of 15years were not included in the survey and results were not available for some states due to technical and logistic reasons.

PATTERN OF DIABETES IN THE NIGER DELTA REGION

A follow-up cross-sectional study⁵ of people living with diabetes in Rivers state (a core Niger Delta state not included in the 1997 survey) revealed diabetes to be a substantial health problem with 780 type 2 diabetics presenting at diagnosis with the following complications

viz neuropathy 439 (56.3%), erectile dysfunction 283 (36.3%), nephropathy 72 (9.2%) and retinopathy 57(7.3%)(table 1).

UNDIAGNOSED DIABETES

It is a fact that type 2 diabetes has an asymptomatic pre-clinical phase which is not benign, thus underscoring the need for primary prevention and population screening in order to achieve early diagnosis and treatment.

The prevalence of undiagnosed diabetes has been found to range from 4.76%⁶ in one study of outpatients attending a family practice clinic to as high as 18.9%⁷ in another study. In the latter study, the prevalence of diabetes was found to be higher by as much as 68% in persons of a higher socioeconomic status.

Earlier studies reported lower prevalence rates for undiagnosed diabetes in the population. Nyenwe et al reported 2.8%⁸ in Port Harcourt while a study in Lagos reported as low as 1.7%⁹ in Lagos metropolis in 1988.

DIABCARE NIGERIA MULTI-CENTRE STUDY

In 2008, the landmark Diabcare Nigeria study¹⁰ was prospectively conducted across seven tertiary health centers in Nigeria with the objective of assessing the clinical and laboratory profile, evaluating the quality of care of Nigerian diabetics with a view to planning improved diabetes care.

The clinical parameters studied include: types of diabetes, anthropometry, blood pressure, chronic complications of diabetes and treatment types. Laboratory data assessed include: fasting plasma glucose (FPG), 2 Hour post-prandial (2-HrPP), glycated haemoglobin (HbA1c), urinalysis, serum lipids, electrolytes, urea and creatinine.

A total of 531 patients, 209(39.4%) males and 322(60.6%) females enrolled. Mean age of the patients was 57.1±12.3 years with mean duration of diabetes of 8.8±6.6 years. Majority (95.4%) had type 2 diabetes mellitus compared to type 1 (4.6%), $p < 0.001$. The mean FPG, 2-HrPP glucose and HbA1c were 8.1±3.9mmol/L, 10.6±4.6mmol/L and 8.3±2.2 % respectively. Only 170(32.4%) and 100(20.4%) patients achieved the ADA and IDF glycaemic targets respectively. Most patients (72.8%) did not practice self-monitoring of blood glucose. Hypertension was found in 322(60.9%), with mean systolic BP of 142.0±23.7mmHg and mean diastolic BP of 80.7±12.7mmHg (see table 2 and 3). The Diabetes complications found were peripheral neuropathy 59.2%, retinopathy 35.5%, cataracts 25.2%, Cerebrovascular disease 4.7%, diabetic foot ulcers 16.0% and nephropathy 3.2%. (See table 2 and 3)

It was obvious from that survey that the status of Diabetes Care in terms of glycaemic control, control to goal of other cardiovascular risk factors, management practices and presence of late complications of diabetes were below the optimum expected.

Arije et al¹¹ reported that satisfactory systolic and diastolic blood pressure control was obtained in only 38.5% and 42.2% of some Nigerian patients attending a tertiary health facility, respectively.

Dyslipidaemia is also common. In a study of 600 patients with type2 diabetes, up to 89% had lipid abnormalities. Elevated LDL-C, TCHOL, TG and reduced HDL-C were noted in 74%, 42%, 13%, and 53% respectively of the study subjects. The commonly noted combined lipid abnormalities were elevated TG and reduced HDL-C. Only a small proportion (8%) of the subjects with dyslipidaemia were on treatment for it¹².

PROGNOSTIC INDICES OF DIABETES MORTALITY

From January through December 2006, subjects with diabetes mellitus (DM) in a tertiary hospital in Nigeria were prospectively studied after admission to assess their short-term outcome which was defined as death.¹³ The total mortality, causes of death, associated complications and duration of hospital stay were noted. The predictive factors for DM morbidity were evaluated using chi test, logistic regression. Student's t test was computed for quantitative data.

A total of 1,327 subjects were admitted to the Medical wards for the duration of the study and the crude death rate was 11%. DM related admissions made up 206 (15%) of all the medical admissions and the case fatality rate was 16% (33). The most common reasons for DM admission were hyperglycaemic emergencies (HE), 88 (40%) and hypertension, 44 (21%). The most common causes of deaths were HE, 15 (46%) and DM foot ulcers (DFU), 10 (30%) while DFU and cerebrovascular disease (CVD) had the highest case fatality rates of 28% and 25% respectively. DFU had the most prolonged duration of admission ranging from 15-122 days. DFU, CVD and type 2 DM were highly predictive of fatal outcomes. The odds ratio and 95% CI for these factors were 4.5 (1.512.7), 3.0 (0.9 9.92 and 3.1 (0.714) respectively. (see table 4).

In a similar study on mortality in in-patients in a tertiary hospital, diabetic patients constituted 10.4% of all hospital in-patients over a 10 year period. The case fatality for the patients with diabetes was 17.2% with acute diabetic complications viz keto-acidosis, hyperglycaemic

Table 1: Pattern of Diabetes in Niger Delta Region⁵

Parameters	Type 1	Type 2	Other types	GDM
Total Number (n)%	25(3.0%)	780(94%)	10 (1.2%)	15(1.8%)
Positive family history of DM (f degree)	3 (12%)	408 (52.3%)	Nil	8 (53.3%)
Polyuria	25(100%)	713 (91.4%)	10(100%)	11(73.3%)
Polydipsia	25(100%)	720(92.3%)	10(100%)	11(73.3%)
Polyphagia	12(48%)	392(50.3%)	-	-
Lassitude	25(100%)	655(84%)	10(100%)	13(86.7%)
Weight Loss	25(100%)	590(75.6%)	10(100%)	7(46.7%)
Blurring of vision	13(52%)	491(62.9%)	10(100%)	4(26.7%)
Recurrent carbuncles (Boils)	9(36%)	79(10.1%)	-	-
Pruritus vulvae	8(32%)	223(28.6%)	-	15(100%)
Coma	8(32%)	39(5.1%)	-	-
Pancreatic calcification	-	-	10(100%)	-
Peripheral neuropathy	3(12%)	439(56.3%)	-	7(46.7%)
Erectile dysfunction	-	283(36.3%)	-	-
Hypertension:	-	-	-	-
*Antedated	-	106(13.6%)	-	-
*Simultaneously	-	197 (25.3%)	-	5(33.3%)
Retinopathy:	-	-	-	-
*Background	-	57(7.3%)	-	-
*Proliferative	-	-	-	-
Nephropathy	-	72(9.3%)	-	-
Dietary (mono) therapy	-	7(0.9%)	-	-
Insulin therapy	25(100%)	176(22.6%)	10(100%)	15(100%)
Oral Hypoglycaemic Agents (OHA)	-	593 (76.0%)	-	-

hyperosmolar state and hypoglycaemia being the most common cause of death in the patients (39.8%)¹⁴.

Note: - i DM 1st degree: Diabetes mellitus in first degree family member. (mother, father or siblings)

ii. Erectile dysfunction (ED): Defined as the inability to achieve and maintain erection sufficient enough to allow

Table 2: Diabcare Nigeria Multi-Centre Study¹⁰: HbA_{1c} Levels Stratified by Different Guidelines

Guideline	Definition	Range (%)	N	Proportion of patients achieving target, n (%)
ADA	Recommendation for adults with diabetes	<7%	525	170 (32.4)
IDF (Type 2)	Target	<6.5	489	100 (20.4)

$$a^2 = 3.74 = 0.053$$

N: number of valid patient data used in the analysis

n (%): number of patients (percent patient)

Table 3: Diabcare Nigeria Multi-Centre Study¹⁰ : Diabetes Complications by HbA_{1c} Categories

Diabetes complications	Mean HbA _{1c} %	HbA _{1c} categories, n (%)		
		<6.5 % (N=105)	≥6.5 to 7.5% (N=142)	>7.5% (N=278)
Eye complications				
All eye complications	8.31±2.16	51 (48.6)	66 (46.5)	135 (48.6)
Adv. Eye disease	8.71±1.91	4 (3.8)	5 (3.5)	21 (7.6)
Background retinopathy	8.44±2.16	32 (30.5)	47 (33.1)	102 (36.7)
Cataract	8.3±2.21	26 (24.8)	36 (25.4)	69 (24.8)
Legal blindness	9.04±1.86	0 (0.0)	1 (0.7)	6 (2.2)
Photocoagulation	9.2±0	0 (0.0)	0 (0.0)	1 (0.4)
Leg complications				
All leg complications	8.71±2.35	23 (21.9)	24 (16.9)	75 (27.0)
Active ulcer/gangrene	8.17±2.03	3 (2.9)	7 (4.9)	10 (3.6)
Bypass/angioplasty	11.25±2.9	0 (0.0)	0 (0.0)	2 (0.7)
Foot pulse absent	8.57±2.23	12 (11.4)	9 (6.3)	34 (12.2)
Healed ulcer	9.06±2.52	12 (11.4)	12 (8.5)	43 (15.5)
Leg amputations	7.06±1.27	4 (3.8)	1 (0.7)	3 (1.1)
Other complications				
All other complications	8.37±2.13	52 (49.5)	85 (59.9)	172 (61.9)
Cerebral stroke	7.76±2.12	5 (4.8)	10 (7.0)	9 (3.2)
End stage renal failure	7.7 ±0.49	0 (0.0)	1 (0.7)	1 (0.4)
MI/CABG/angioplasty	0±0	0 (0.0)	0 (0.0)	0 (0.0)
Signs of neuropathy	8.4±2.14	51 (48.6)	82 (57.7)	171 (61.5)

N: number of valid patient data used in the analysis

n (%): number of patients (percent patient)

SD: standard deviation

MI/CABG/angioplasty: myocardial infarct/coronary angioplasty bypass graft/angioplasty

Table 4: Prognostic Indices Of Diabetes mortality¹³

Admission diagnosis	Frequency
Hyperglycemic emergencies (HE)	82(40%)
Poorly controlled blood pressure	44(21%)
DM foot ulcers (DFU)	36(17.5%)
Cerebrovascular disease (CVD)	20(9.8%)
Hypoglycemia	7(3%)
Peptic ulcer disease (PUD)	6(3%)
Tropical hand ulcer (TDHS)	2(1%)
Kochs disease	2(1%)
Retroviral infection	1 (0.7%)
Chronic renal failure	6(3%)
TOTAL	206 (100%)

Table 5: Causes of Deaths In DM Subjects¹³

Causes of death	%of total DM deaths	Case fatality rate
HE	15(46%)	18%
CVA	5(16%)	25%
DFU	10(30%)	28%
Hypoglycemia	1(3%)	14%
CRF	1(3%)	16%
Bleeding PUD	1(3%)	16%

HE=Hyperglycemic emergencies; CVA=Cerebral vascular accident; DFU=diabetic foot ulcer; CRF=chronic renal failure; PUD=peptic ulcer disease

Table 6: Morbidity and Mortality Data according to the Age Groups¹³

Age Classes	DM admissions	Hypertension	DM-related deaths
<34years	20(10%)	0	2(6%)
35-64years	116(56%)	23(52%)	19(57.6%)
>65 years	70(34%)	21(48%)	12(36.4%)

satisfactory sexual intercourse

iii OHA: Oral Hypoglycaemic agent

Priorities, Needs and Recommendations

The crucial issues arising from these Nigerian studies are: most Nigerians living with diabetes mellitus have suboptimal glycaemic control, are hypertensives, not meeting blood pressure and lipid targets and have chronic complications. Our present national aims and objectives towards improving diabetes care and prevention should focus on the following priorities, needs and recommendations.¹⁵

Improve health outcomes for people with diabetes.

Complications of type 1 and type 2 diabetes can be prevented or significantly delayed. The essential medicines, diagnostic and monitoring technologies and education required are cost-effective, but tragically inaccessible to many. A sustainable system to provide the essentials to people with diabetes is required. Development and appropriate use of health services, especially primary care services, can avert costly end-stage complications and optimise the impact of funds spent on healthcare.

The following recommendations are outlined to improve health outcomes of people with diabetes:

Provide essential care to all people with diabetes

Risk assessment and early diagnosis

Access to essential low-cost medicines and supplies

Self-care education

Improve medicine-distribution systems

Integrate diabetes and NCD care into health services for communicable diseases

Improve healthcare systems so that essential diabetes care can be reliably delivered

Improve the training, continuing education and support of health professionals

Integrate training of health work force, covering diabetes and related NCDs and infectious diseases

Create shared record keeping systems to coordinate care over time and across caregivers

Extend health services to all areas of the country.

Provide care and support for people with diabetes complications

Programmes for detection and management of the complications of diabetes

Access to treatment, rehabilitation and social support for people who develop disabilities.

Clinical Practice Guideline.¹⁶

Outpatient glycaemic, Lipid and Blood Pressure control: Achieving and maintaining good glycaemic control by treating-to-target, is the goal of using guidelines. This is achieved by being proactive when glycaemic control is not at, or drifts away from acceptable

targets. The definitive action often required is prompt anti-hyperglycaemic treatment to the next step in the treatment Algorithm.

Out-patient Initiation of Basal Insulin (intermediate acting insulin) + Oral agents

Basal Insulin is administered as a total daily dose at bedtime (22.00hrs)
 Dose calculation (titration) e.g.: (weight) 70kg x 0.2IU = 14IU of Insulin
 Continue SU at half maximum dose & metformin at 2gm daily.
 Monitor effect of bedtime Insulin by the fasting blood sugar

Out-patient Substitution Therapy with Pre-mixed Insulin (biphasic insulin)

If control is not achieved with a total Basal Insulin (intermediate acting) dose of 25-30IU, switch patient to twice daily biphasic insulin
 Give 30min before breakfast and dinner.
 Sulphonylureas should be discontinued
 If no contraindications Metformin can be continued if person is obese.

Annual Review

- Screening for proteinuria/microalbuminuria
- Screening for retinopathy
- Foot examination
- Education (as needed)

Prevent the Development of type 2 diabetes

The onset of type 2 diabetes in people at high risk can be prevented or significantly delayed. This is cost-effective. Failure to invest in prevention strategies means that the number of people with diabetes will continue to increase at unsustainable rates. The key modifiable risk factors for type 2 diabetes which are physical inactivity, inappropriate nutrition and obesity are not just a matter of personal choice. Environments that encourage sedentary behaviour and high-energy low-nutrient diets pose almost insurmountable barriers to healthy lifestyles. Such environments are found in all aspects of our modern life in work, in communities and in leisure.

The following recommendations are outlined to prevent the development of type 2 diabetes:

Adopting a 'Health in All Policies' approach

Ensure all public policy sectors (education, transport, housing) protect and promote health
 Strengthen multi-stakeholder partnerships to prevent diabetes

Make healthy nutrition available to all - especially to pregnant women and children

Promote breastfeeding
 Promote healthy diet through education
 Control marketing and advertising of unhealthy food and beverages
 Labeling food products
 Access to healthy food for disadvantaged population groups

Promote physical activity through education
 Create adequate environments and facilities to promote physical activity

Consider a 'High-Risk' Prevention Programme where appropriate

Implement a prevention programme for people at high-risk of type 2 diabetes

Stop discrimination against people with diabetes

Millions of people with diabetes face stigma and discrimination. This promotes a culture of secrecy that can create barriers to services, employment, and even marriage, and may stop people with diabetes playing an active role in society. This burden is greater for children, indigenous peoples, ethnic minorities, women and the poor. Nobody should suffer discrimination and stigma because of their diabetes. Action is required at international and national levels to ensure that the human rights of people with or at risk of diabetes are protected.

The following recommendations outlined to stop discrimination against people with diabetes:

Enable people with diabetes to claim their rights and responsibilities

Sign an International Charter of Rights for People with Diabetes
 Provide legal support and advice for people with diabetes

Increase public awareness of diabetes and reduce diabetes related stigma

Develop information campaigns to raise awareness of diabetes and reduce stigma
 Identify and support high profile and community level champions of diabetes

Empower people with diabetes to be at the centre of the diabetes response

Include people with diabetes in all phases of diabetes

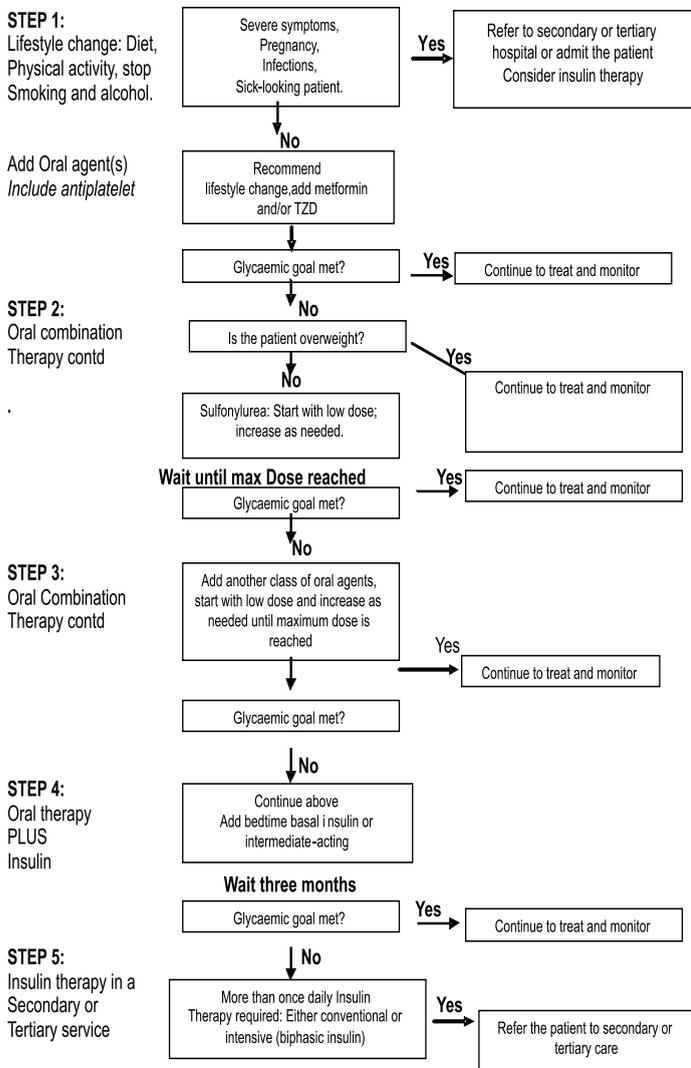
Table 7: Optimal Targets for Glycaemic, Lipid, Blood Pressure and Weight Control¹⁶

Biochemical Index:	OPTIMAL	
Capillary blood glucose values (fingep prick)	mmo1/L	mg/dl
Fasting	4.6	72-108
2-hour post-prandial	4.8	72-144
Glycated haemoglobin (HbA1c) (%)	<7	
Weight BMI (kg/m2)	<25	
Blood Pressure (mmHg):		
Systolic	<130	
Diastolic	<80	
If persistent, dipstick for proteinuria		
Systolic	<125	
Diastolic	<75	
Lipids:	,mo1/L	mg/dl
Total cholesterol	<5.2	<93.6
LDL cholesterol	≤2.6	≤46.8
HDL cholesterol	>1.1	>19.8
Triglycerides	<1.7	<30.6

Table 8: Mapping between HbA1c Values and Estimated Average Glucose (EAG) measurement ¹⁷

HbA1c Test Score	Mean Blood Glucose Mg/dL	Mean Blood Glucose mmol/L
13.0	380(380-417)	21.1
12.0	298(240-347)	16.5
11.0	269(217-314)	14.9
10.0	240(193-282)	13.4
9.0	212(170-249)	11.8
8.0	183(147-217)	10.2
7.0	154(123-185)	8.6
6.0	120(100-152)	7.0
5.0	97(76-120)	5.4
4.0	50(50-80)	4.7

Figure 1: Algorithm on the glycaemic management of T2DM
Adapted and modified from IDF clinical practice guideline for Type 2 Diabetes in Sub-Sahara Africa



policy and programme design
Support the creation and capacity building of organisations and networks of people with diabetes

The UN Summit on NCDs

The United Nations High-Level Summit on NCDs, which held in September 2011 was a unique opportunity to reverse the

current diabetes and global NCD epidemic trends. In order for its recommendations to be successful, it is vital that world leaders commit to specific actions.

The UN general assembly, the principal decision making body of the UN which represents all UN member states, held a UN summit on Non-communication Disease (NCD's) in order to bring global attention to these diseases and agreed on a plan of action to address them part of which includes;

1. Form and strengthen NCD alliance at local, national, regional and international levels with specific objectives.
2. IDF is leading the global diabetes community to maximize the opportunity of the UN Summit on NCDs for diabetes. Our Member Associations are keys to the success of this, in bringing global advocacy to the national and local level.

CONCLUSION

Most Nigerians living with diabetes have suboptimal glycaemic control, are hypertensives, not meeting blood pressure and lipid targets and have chronic complications. Improved quality of care and treatment to targets is recommended to reduce diabetes related morbidity and mortality.

Our top national diabetes priorities should include:

- Equitable, universal access to care, essential medicines and supplies
- Prevent type 2 diabetes through healthy lifestyle promotion
- Development and implementation of a National Diabetes Programme.

ACKNOWLEDGMENT

1. My personal assistants for the secretarial assistance and logistics support.

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