

## Undiagnosed diabetes mellitus: a survey of dental outpatients in a tertiary hospital

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### Abstract

**Background:** Most dentists depend on the history given by the patients when assessing their medical status. However, quite a number of these patients may be unaware of their medical condition, which may be significant in the planning of their dental treatment.

**Objectives:** To determine the prevalence of undiagnosed diabetes mellitus and the factors associated with hyperglycaemia among patients presenting at a tertiary Dental Clinic in Nigeria.

**Methodology:** Their blood samples were assessed for glucose by means of a glucometer (Accu-Chek® Active, Roche diagnostic). Random blood glucose (RBS) equal to or greater than 200mg/dl was considered diabetic. Statistical significance was set at  $p < 0.05$ .

**Results:** Nine (4.4%) of the 203 patients seen were diabetic with a male to females ratio of 1:2. Gender, socioeconomic status, body mass index, family history of diabetes was not significantly associated with abnormal blood glucose. However, there was a statistically significant difference in the mean ages of patients with normal blood glucose ( $39.2 \pm 12.4$ ) and diabetes mellitus ( $55.5 \pm 16.9$ ) ( $p = .000$ ). About 51.2% (104) of the subjects have never checked their blood sugar.

**Conclusion:** This study showed that patients' account of their systemic status is not always reliable. Thus, it will be of immense benefit if dentist seeks symptom/sign that may aid in identifying those at risk or those that are already diabetic. Furthermore, routine screening for diabetes mellitus amongst patients aged 45 years and above may reduce the morbidity and mortality associated with the disease.

**Keywords:** Prevalence, undiagnosed, diabetes, dental, outpatients, medical history

### Résumé

**Introduction :** La plupart des soins diabétiques dépendent de l'histoire donnée par les patients lors de l'évaluation de leur état de santé. Cependant, un

certain nombre de ces patients peut ne pas être au courant de leur état de santé, ce qui peut ne pas être important dans la planification de leur traitement dentaire. Afin de déterminer la prévalence du diabète non diagnostiqué et les facteurs associés à l'hyperglycémie chez les patients se présentant dans une clinique dentaire tertiaire au Nigeria.

**Méthodologie :** Les échantillons sanguins ont été évalués par le glucose à l'aide d'un glucomètre (Accu-Chek ® Active, Roche diagnostic). La glycémie aléatoire supérieure ou égale à 200 mg/dl était considérée comme diabétique. La signification statistique était fixée à  $p < 0,05$ .

**Résultats :** Neuf (4,4%) des 203 patients consultés étaient diabétiques avec un ratio mâle / femelle de 1:2, le statut socio-économique, l'indice de masse corporel et les antécédents familiaux de diabète n'étaient pas significativement associées à la glycémie anormale. Cependant, il y avait une différence statistiquement significative entre l'âge moyen des patients avec glycémie normale ( $39,2 \pm 12,4$ ) et ceux atteint du diabète sucré ( $55,5 \pm 16,9$ ) ( $p = .000$ ). Près de 51,2% (104) des sujets n'ont jamais vérifié leur taux de sucre sanguin. **Conclusion :** Cette étude a montré que le bilan du statut systémique des patients n'est pas toujours fiable. Ainsi, il sera d'un grand avantage de la recherche des symptômes et signes qui pourront aider à identifier les personnes à risque ou ceux qui sont déjà diabétique. En outre, le dépistage systématique du diabète sucré chez les patients âgés de 45 ans et plus peut réduire la morbidité et la mortalité associées à la maladie.

### Introduction

Diabetes mellitus (DM) is the most common human endocrine disease and is gradually attaining pandemic proportions with not less than 5% of the population affected [1]. DM is one of the most common chronic diseases in the United States of America, while its growth rate in sub-Saharan Africa is one of the highest in the world [2, 3]. It is defined as a group of metabolic diseases characterised by hyperglycaemia resulting from defects in insulin secretion and or peripheral resistance to insulin. There is relative or absolute deficiency of insulin because there is autoimmune destruction of pancreas or an



increased peripheral resistance to insulin. Symptoms include polyuria, polydipsia, polyphagia and weight loss [4].

Diabetes mellitus is very important to the dental practitioners in that, apart from the possibility of complications during dental procedures, uncontrolled diabetes mellitus may predispose to oral diseases such as periodontal disease, oral abscesses, xerostomia, halitosis and burning mouth syndrome [1, 5]. Microvascular and macrovascular diseases have been described among diabetic patients, as well as the possibility of a reciprocal relationship between DM and periodontal disease. The reciprocal relationship is such that, while diabetic patients are more prone to periodontal diseases, periodontal infections also tend to impair glycaemic control in diabetic patients [6, 7]. The routine in most dental facilities is to depend on the past medical history as given by patients who sometimes are unaware of their prevailing medical condition. The aim of this study was to assess the prevalence of undiagnosed diabetes mellitus and the factors that are associated with hyperglycemia among dental patients at the University College Hospital, Ibadan, Nigeria.

**Material and methods**

A cross sectional survey of 203 apparently healthy dental patients was undertaken between the months of June and September, 2011 at the dental outpatient clinic of the University College Hospital, Ibadan Nigeria. All known diabetic patients and those below 20 years of age were excluded from the study.

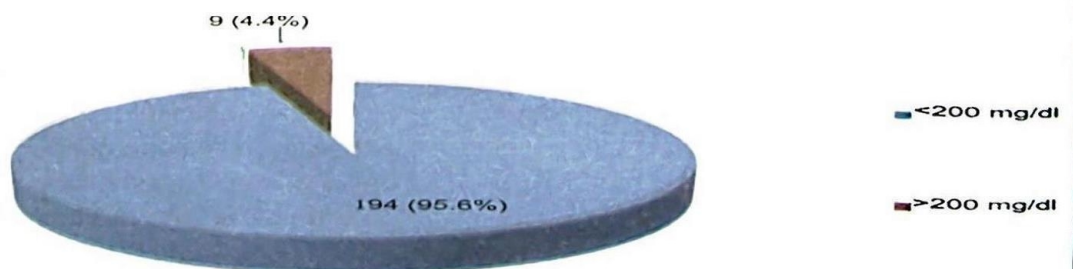
Following a spirit swab, finger-stick capillary blood was collected and analysed using a blood glucose self-monitoring device (Accu-Chek® Active, Roche diagnostic). The sterile lancet provided in the kit was used for sample collection in order to ensure infliction of minimal trauma during sample collection. Haemostasis was achieved by the application of pressure with cotton wool after the sample collection. Random blood glucose (RBS) of 200 mg/dl and above was considered to be diabetic [4]. Data was analysed with Statistical Package for Social Sciences (SPSS) windows version 14.0 (SPSS Inc. 2005). Level of statistical significance was set at  $p < 0.05$ .

The socio-economic status of subjects was determined based on their occupation and educational attainment. Each of the participants was scored on a scale of 1 to 5 for both their occupations and their educational status. The mean score of these two criteria to the nearest whole number was calculated as the social class for each of them. A mean score of 1 was classified as high social class, 2 and 3 as middle class, while 4 and 5 were categorised as low social class [8]. Ethical approval was obtained from the joint University of Ibadan/ University College Hospital Institutional Review Committee (U.I/U.C.H IRC) before the commencement of the study.

**Results**

A total of 203 patients were examined consisting of 89(43.8%) males and 114 (56.2%) females with a mean age of  $40.4 \pm 13.1$  years. There was a statistically significant difference ( $p = .000$ ) between the mean age of patients with normal glucose level ( $39.7 \pm 12.4$ ), and DM ( $55.5 \pm 16.9$ ). About 95.6% (194) of the participants had normal blood glucose while only 4.4 % (9) were discovered to have diabetes mellitus (Figure 1). The diabetic subjects consisted

**Figure 1: Pattern of blood glucose level amongst dental outpatients**



**Figure 2: Frequency of checking blood glucose level by dental outpatients**



of 6 females and 3 males, but there was no statistically significant difference in the gender distribution of diabetes in the study population ( $p=0.385$ ). Likewise, socioeconomic status, body mass index and family history of diabetes were not significantly associated with the blood glucose level.

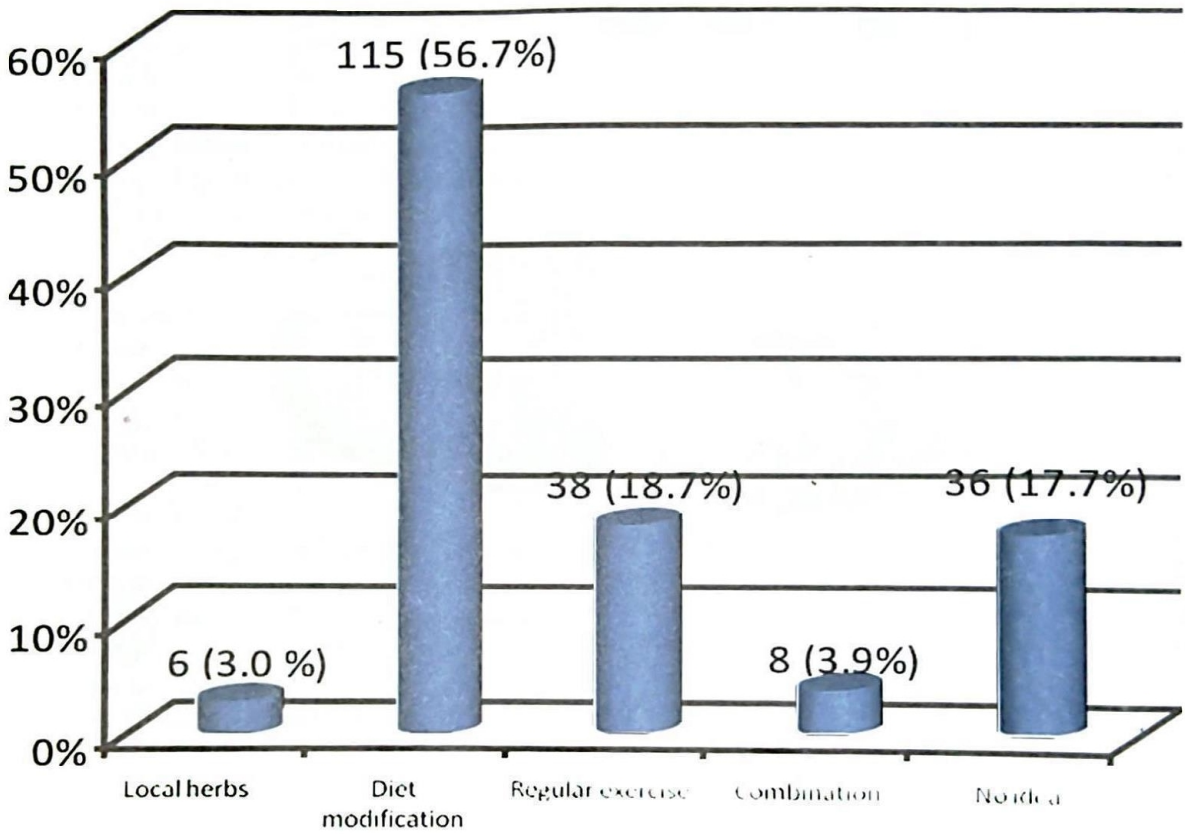
About 51.2% (104) of the subjects have never checked their blood sugar before, while 70 (34.5%) checked it occasionally (Fig. 2). Out of the 93 patients who were aged 40 years and above, only 16 (17.2%) monitored their blood glucose regularly and 40.9% had never checked their blood sugar previously. Seventeen (47.2%) of those with a positive family history of diabetes mellitus had never checked their blood glucose at least once before the study. Most of the participants aged 45 years and above

(59.1%) have checked their blood glucose at least once before the study, but majority of those younger than 45 years (56.2%) have never checked their blood glucose before, but the difference was not statistically significant.

Diet modification was considered by majority (56.7%) of the subjects as the most effective method of preventing diabetes mellitus, 18.7% believed that regular exercise is the best method while only 3.9% of the subjects considered the combination of regular exercise and diet modification as the best preventive method (Fig. 3). There was a statistically significant difference between the age of those with deranged blood glucose and those with normal glucose level ( $p < 0.009$ ) (Table 1).



**Figure 3: The most beneficial method of preventing diabetes mellitus as perceived by dental out-patients**



**Table 1: Age and blood glucose distribution of subjects**

	Age (Years)	Diabetes Mellitus		Total (%)
		No (%)	Yes (%)	
	<40	109 (53.7)	1 (0.5)	110 (54.2)
	>40	85 (41.9)	8 (3.9)	93 (45.8)
<b>Total (%)</b>		194 (95.6)	9 (4.4)	203 (100)

( $\chi^2 = 7.039, df=1, p=.009$ )

**Discussion**

The American Diabetes Association recommends that screening for diabetes should commence at 45 years of age and be repeated every 3 years in persons without risk factors for diabetes while recommending an earlier and more frequent screening in those at increased risk [4]. Despite this recommendation, several people with diabetes mellitus go undiagnosed until complications arise [9, 10]. The majority of participants in this study have never checked their



blood glucose level previously, which contradicts the recommendation by the expert committee on the diagnosis and classification of diabetes mellitus [4]. This situation may be improved if the general public is enlightened concerning the need for routine screening for diabetes mellitus, which may help in the prevention and management of the condition.

About a third of those with diabetes globally are unaware of their condition, [5] with about 85% of these undiagnosed diabetic patients residing in the low and middle income parts of the world [3]. Presently, no country can boast of having diagnosed all DM cases within its shores [1, 2, 9]. The 4.4% observed with blood glucose suggestive of diabetes mellitus in this study, is in agreement with the study by Ojehanon and Akhiohare [11], who reported a prevalence of 4.5% for those that had fasting blood glucose of 126 mg/dl and above among some dental patients. While it is higher than the 2.5% reported for non-Hispanic Whites, 3.6% for non-Hispanic Blacks but in agreement with 4.5% for Mexican-Americans in the study by Harris et al [12]. The difference in prevalence could be attributed to environmental and socio-cultural differences among the different study populations. This is because apart from genetic factors, life style is a major risk factor for diabetes mellitus [13, 14].

Majority of the diabetic subjects in this study were above 61 years of age with only one subject below the age of 40 years. This is in agreement with the findings from previous studies, which have established that there is increased prevalence of DM as age advances [2, 12, 13]. This had been attributed to cumulative mitochondrial damage caused by reactive oxygen species. The resulting mitochondrial dysfunction is believed to be central to the failure of  $\beta$ -cells of pancreatic islet [15]. In this study, no diabetic patient was below the age of 30 years while a national report from USA found DM in about 0.26% of people younger than 20 years and 26.9% of the cases found in those above 65 years of age. These findings from the same socio cultural setting further confirm DM as a disease whose incidence tend to increase with age [16]. Only age had a statistically significant association with DM in this study amongst the risk factors assessed.

In this study, overweight and obesity were not statistically associated with being diabetic. This is contrary to most research findings which reported that obesity predisposes to increased risk of diabetes mellitus [13, 14, 17]. It has been established that most obese people do not develop DM [13]. The fractions that succumb to DM are those that are unable to sustain compensatory  $\beta$ -cells response to the

increasing metabolic stress associated with obesity [15]. In addition, research has discovered that both obesity and hyperglycemia are associated with reactive oxygen species which promote DNA fragmentation, protein cross linking and peroxidation of membrane phospholipids in mitochondria. These molecular injuries are central to dysfunction of the beta cells of the islet of pancreas [15].

Decades of research have demonstrated a striking and profound association between socio economic status (SES) and all measures of disease, either as rate, severity or outcome of disease [18, 19], with people in the lower socioeconomic classes having a poorer health in comparison with those in the higher class [20]. In this study, SES was not significantly associated with DM. This is probably because only highest level of education and occupation were utilized in categorizing participants into socioeconomic classes. While other measures of SES such as income, living space, family size have merit and multiple socioeconomic indicators are more likely to give a better stratification into socio economic classes [18, 20, 21].

Diverse research, including randomized clinical trials have proven that life modification in the form of physical exercise and improved dietary habit is the most cost effective method of preventing as well as delaying the onset of type 2 diabetes mellitus [10, 22, 23]. Less than 4% of our study population know that exercise and diet modification are the most important means of preventing diabetes mellitus. The majority, are of the opinion that dietary modification will best prevent DM, while 36 (17.7%) have no clue as to how it may be prevented. This paucity of knowledge may be responsible for the rise in unhealthy life style such as high caloric diet and reduced physical activity amongst our people [5]. Six of the subjects in this study are of the opinion that DM is best prevented by use of herbs. Several local herbs have been shown to have some anti-hyperglycemic effect, which include *Phyllanthusniruri*, *Zingiberzerumbet*, *Eurycomalongifolia*, *Mangiferaindica* and *Andrographispaniculata* [24]. However, recent researches have shown that herbs and other natural products, do not often deliver the health benefits promised the consumer because the products vary from batch to batch. Nevertheless, they have the potential to play significant role in patient management if scientifically developed [25, 26].

Some of the subjects in this study who were designated as having normal blood glucose could be having glucose intolerance because DM is often preceded by some years of glucose intolerance in



about 60% of diabetic cases [23, 27]. This diagnosis could have been made if oral glucose tolerance test was done instead of the random blood glucose that was used in this study. This would have been more beneficial because screening of the population should be for a condition that precedes DM, such as impaired fasting glucose or impaired glucose test, since these conditions are associated with a substantially increased risk of cardiovascular disease and dyslipidemia [27]. Also, measures such as weight loss, regular exercise and diet modification have been reported to result in the delay or prevention of progression to DM in this group of patients [22, 23].

In conclusion, this study shows that patients' account of their systemic status is not always reliable. Thus, it will be of immense benefit if dentist would seek symptom/sign that may aid in identifying those at risk or already diabetic. This is of great importance especially in those above 50 years of age. Also, increased awareness of the population on the need for routine screening for diabetes especially in individuals above 45 years is essential.

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Received: 05/09/12

Accepted: 18/12/12