Screening for proteinuria and glycosuria among dental patients in Benin City

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Abstract

Objective: To screen for the presence of proteinuria and glycosuria amongst patients attending for routine care in a dental clinic in Benin- City, Edo State, Nigeria.
Method: A prospective survey over a period of thirty-six months involving all new consecutive and consenting patients. All consenting patients, yet to have breakfast and with no history of previous screening for proteinuria and glycosuria were screened, using Clinistix test strips. Medical and drug history, and relative risk were given due considerations in patient selection. Athletes, specifically marathon runners were excluded. Findings were analysed as simple frequency tables and percentages.
Results: A total of four thousand, four hundred and ninety patients who attended the Oral Diagnosis Clinic of the Faculty of Dentistry, University of Benin and met inclusion criteria were screened. Fifty three (1.2%) positive cases of glycosuria were recorded. The male: female ratio was 1:1.1 and the majority of patients (49%) were in age group 19-29 years. Forty three (1.0%) were positive, for proteinuria. There was a preponderance of females (1.7%) over males (0.8%) and most patients (65.1%) were in the 19-29 years age group.
Conclusion: Most patients were asymptomatic and accepted a referral to the physician. It is recommended for the benefit of attending patients to the dental surgery to include routine urine analysis for glucose and protein in addition to the usual assessment of vital signs.

Key words: proteinuria, glycosuria, screening, dental patients

Introduction

Screening is categorized as the secondary level of prevention and scientific literature has certified the dental clinic, as an excellent venue of screening for systemic diseases like anaemia, hypertension, diabetes and syphilis[1-4]. The prevalence of undiagnosed medical conditions and their negative impact on dental treatment outcome justifies urine screening of dental patients. Screening high risk patients using non-invasive methods during routine checks has been considered as a cost-effective approach. For example routine dipstick urinalysis for glucose identifies pregnant women at increased risk for gestational diabetes[5].

The presence of protein and glucose in the urine of an individual is an indicator of an array of systemic abnormalities and may be due to such diseases as urinary tract infections, glumerulonephritis, nephritic syndrome, eclampsia, urinary schistosomiasis, hypertension and severe febrile illness[6]. Proteinuria has also been reported as a marker of kidney disease and atherosclerosis, both of which are known predictors of cardiovascular mortality[7-9].

Proteinuria is categorized based on site of renal pathology, as glomerular origin and tubular origin. Other categorization is based on the nature of the excreted protein, which may be albumin, globulins, kappa or lambda light chains, or Tamm Horsfall protein[10].

Urine provides a non-invasive means of screening for conditions like diabetes mellitus, nephropathy, chronic renal failure, helminthic infestations and Cushing's syndrome[11-15]. However most routine screening programme targeted parameters were protein, sugar, blood cells, nitrites and micro-organisms[5, 16-18].

The dental surgeon is in a unique position to screen patients for proteinuria and glycosuria as part of routine tests before treatment as the number of dental patients with insidious medical illnesses have been found to be on the increase[19]. The equipment required for screening is inexpensive, reliable and easy to use[20] and the benefit to the patient and the health care delivery system is enormous[14,21].

Plausible information is currently available with regards to data on urinary screening in dental patients. The aim of this paper is to determine the prevalence of proteinuria and glycosuria in a selected dental clinic with a view to counseling positive cases and referring such cases to the physician, for further evaluation, management and follow-up care.

Materials and method

This survey was conducted in the Department of Oral Diagnosis of University of Benin Faculty of Dentistry, between January 2005 and December 2007. All new consecutive and consenting patients with no history of previous screening were screened for proteinuria and glycosuria. Medical and drug history, and relative risk were

also given due consideration in patient selection. Athletes specifically marathon runners were excluded.

Urine was collected from the patients using clean specimen bottles. The test was carried out by a registered nurse, using Medi-Test Combi 2® (Maacherey-Nagel, Germany) test trips for protein and glucose. Detection of protein is based on the "protein error" principle of indicator (tetrabromophenol blue). The test zone changes colour from yellow to greenish blue in the presence of albumin. Glucose detection is based on the glucoseoxidase-peroxidase-chromogen reaction. Colour change in the presence of glucose is from green to bluish green.

Data was analysed by use of simple frequency tables and percentages.

Known systemic conditions that modify the results of screening as well as demographic data were documented, while patients with proteinuria and glycosuria were counselled and referred to the physician for further evaluation and management.

Result

Four thousand, four hundred and ninety patients were involved in the study. There were 1863(41.5%) males and 2627(58.5%) were females **(Table 1)**. A total of 53(1.2%) had glycosuria, **(Table 2)**, consisting of 25(0.5%) males and 28(0.6%) females, giving a male to female ratio of 1:1.1. Most patients (49%) were in the 19-29 year age group with a mean age of 23.3years. A total of 43 (1.0%) of the patients had proteinuria. This comprised of 14 (0.8%) male and 29 (1.7%) female giving a males to females ratio of 1:2.1 **(Table 3)**.

Table 1. Demographic characteristics of the study population.

Age range (in years)	Number	Male	(%)	Female	(%)
10-19	681	320	(7.13)	361	(8.04)
20-29	840	410	(9.13)	430	(9.58)
30-39	800	350	(7.80)	450	(10.02)
40-49	754	250	(5.57)	504	(11.23)
50-59	740	311	(6.93)	429	(9.56)
60-69	399	120	(2.67)	279	(6.21)
70-79	276	102	(2.27)	174	(3.88)
Total	**4490**	**1863**	**(41.5)**	**2627**	**(58.5)**

Table 2. Distribution of subjects with glycosuria by age and gender

Age range (in years)	Number	Male	(%)	Female	(%)
10-19	12	7	(0.16)	5	(0.11)
20-29	14	6	(0.13)	8	(0.18)
30-39	6	3	(0.07)	3	(0.07)
40-49	7	2	(0.05)	5	(0.11)
50-59	8	4	(0.09)	4	(0.09)
60-69	3	2	(0.05)	1	(0.02)
70-79	3	1	(0.02)	2	(0.05)
Total	**53**	**25**	**(0.56)**	**28**	**(0.62)**

Table 3. Distribution of subjects with proteinuria by age and gender

Age range (in years)	Number	Male	(%)	Female	(%)
10-19	9	2	(0.05)	7	(0.16)
20-29	19	6	(0.13)	13	(0.29)
30-39	7	-	(-)	7	(0.16)
40-49	3	1	(0.02)	2	(0.05)
50-59	3	3	(0.07)	-	(-)
60-69	1	1	(0.02)	-	(-)
70-79	1	1	(0.02)	-	(-)
Total	**43**	**14**	**(0.31)**	**29**	**(0.65)**

Discussion

Average daily protein excretion ranges from 40 to 80 mg. It becomes abnormal if it becomes detectable in urine with excretion rate exceeding 150 mg/day. However, the determination of total protein, type of protein and cause of the proteinuria has important implications for the diagnosis, prognosis and treatment of renal disease.

High urinary protein is a valuable sign of renal glomerular disease, multiple myeloma, systemic lupus erythematosus and congestive heart failure; conditions that can modify treatment planning[22]. For example patient with systemic lupus erythematosus being treated with corticosteroid need precautions to prevent steroid collapse and prevent unnecessary biopsy of oral white plaque of renal diseases.

Serum concentration of glucose must be higher than 130-140mg/100ml for it to appear in urine. A positive reaction to simple reaction strip may indicate occult diabetes mellitus, low threshold for glucose, pancreatitis, liver damage, phaeochromocytoma or hyperthyroidism[23].

Findings from this study compares favourably with the results of other screening studies elsewhere[11,12]. The prevalence of proteinuria seen in this study was higher than the 1% found among Nigerian school children in Port Harcourt[24], 0.12% found among Malaysian children[17], 0.23% in young adult population[25], 0.45% in selected university student study population[26] and <1% in all age groups of healthy adults studied[27], but lower than 2.2% and 4.8% found among teenage secondary school and university students respectively in Nairobi, Kenya[18,28]. It is also lower than 6.3% in 1987, and 6.9% in 1988 reported among patients and students of Fukuoka dental college respectively[29].

The prevalence of glycosuria in this study was higher than 0.5% in 1987 and 0.1% in 1988 found among patients and students of Fukuoka Dental College respectively[29] but lower than 4.75% reported Polyclinics at Korle bu and Mamprobi, Ghana[30] and 2.9% in residents of the town of Andizhan and of the rural districts of the Andizhan region[31]. A study revealed no glycosuria in university candidates undergoing routine urine analysis[28].

Gender difference in incidence of proteinuria and glycosuria has been documented but few authors reported significant difference in the prevalence of proteinuria between the sexes[17,18]. In this study, there was a higher incidence of proteinuria and glycosuria in females which contrasted with findings among healthy adults in which there were more men (4.9%) with proteinuria than women (3.9%)[32] but similar to the findings of higher levels of

proteinuria in girls than in boys in a four-year prevalence study of students of the elementary and junior high schools in Taiwan[33]. The incidence of glycosuria was more in women than in men (3.3 and 2.4%, respectively) [21] but Carel et al, 1987 reported no gender difference in the incidence of glycosuria [32].

Young individuals formed the majority of the participants in this study because dental office patients are predominantly young adults and older patients who were. The highest incidence of glycosuria was observed within the age group of 21-30 years in a previous study[30] which was similar to the finding in this study in which most patients (65.1%) were in the 19-29 years age group. Other studies reported glycosuria more frequently encountered in persons of older age groups than in young individuals (0.6-2.8% in persons aged under 30 years, and 5.1--6.3% in persons aged 30 to 70 years and older) [31].

While the presence of protein or glucose in urine may suggest some systemic diseases[11,13,14], most patients are asymptomatic[11,17]. The incidence of systemic diseases discovered as a result of urine screening programme has been documented[11,34]. Although the present study did not include monitoring of referrals to the physician, it has been shown that early detection of proteinuria (i.e. microalbuminuria) and timely treatment can modify the natural course of any disease diagnosed[14]. Also early treatment of these diseases has been found to be a very cost effective use of health care resources. For example, one study[21]has calculated the cost effectiveness ratio for early screening and treatment for insulin dependent diabetes mellitus at $7,900 to $16, 500 per year of life saved. The Medi-Test Combi 2® is cheap ($10 for 100 strips) easy to use, yield rapid results, reliable and stable.

There exists a significant association of glycosuria with progress of dental diseases and adverse treatment outcome. Poorly controlled blood sugar level and the resultant high levels in oral fluids may propagate the growth of microorganisms[35-37]and set the stage for the initiation and propagation of periodontal diseases with its consequences, including candida infections[35]on the oral health and general wellbeing. The problem is poor control and its sequelae including poor wound healing, dry socket and pain following an otherwise successful extraction[38]. These findings attest to the utility and practicability of incorporating urine testing into various screening and clinical examinations. A positive result for proteinuria or glycosuria should prompt a further referral to the physician.

Conclusion

The prevalence of asymptomatic proteinuria and glycosuria in this study, justifies routine urinary screening of dental patients, particularly young adults given the high diagnostic yield. Early detection of such conditions is very beneficial to the affected individual.

It is recommended for the benefit of attending patients to the dental surgery to include routine urine analysis for glucose and protein as an adjunct to the usual monitoring of vital signs. More so when one considers the fact that hypertension and diabetes mellitus, among other systemic conditions, can modify treatment plan and outcome of dental treatment.

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