Sokoto Journal of Medical Laboratory Science 2022; 7(1): 38 - 43

SJMLS - 7(1) - 004

Serum Vitamin D Levels Among Type 2 Diabetic Patients in Nigeria: Preliminary Findings

Oko, C.B., Anaja, P.O.*, Nwaelugo, R.A., Okafor, P.A.
Department of Chemical Pathology A.B.U Teaching Hospital Shika – Zaria, Nigeria

Author for Correspondence*: anaja2ng@yahoo.com/+234-080-3314 8528/https://dx.doi.org/10.4314/sjmls.v7i1.4

Abstract
Type 2 diabetes mellitus (type2 DM) has become a global health challenge. Nigeria is experiencing an upsurge in the prevalence of the disease and insulin resistance (IR) arising from obesity has been observed to be one of the causes. Vitamin D insufficiency has been implicated in IR and ultimately type 2 DM. The current study was aimed at evaluating serum vitamin D levels in type 2 DM in one of the fastest growing cities in Africa, Abuja, Nigeria. Eighty-eight (88) subjects were recruited for the study. These were made up of 53 type 2 diabetic patients (23 Males; 30 Females) and 35 control subjects (13 Males; 22 Females). Serum vitamin D and other biochemical analytes were measured using standard laboratory techniques. The results showed significantly higher ($p<0.05$) mean blood glucose (8.7± 0.38 mmol/L) and glycated haemoglobin (HbAic) (6.5 ± 0.41%) levels in the diabetic patients than in the controls respectively (4.6 ± 0.08 mmol/L; 4.3 ± 0.11%). The mean serum vitamin D value (42.1 ± 5.0 ng/ml) was significantly lower ($p<0.05$) in the diabetic patients than in the controls (184.5 ± 13.1 ng/ml). The values were higher in males (47.5 ± 9.7ng/ml) than in females (38.3 ± 5.2 ng/ml) in the diabetic group. The relationship between vitamin D and other parameters were not statistically significant. There is need for further study in Northern Nigeria involving large sample size.

Keywords: Vitamin D, diabetes mellitus, glucose, HbAic

Introduction
Type 2 diabetes mellitus (type 2 DM) has become a global health challenge. Nigeria is experiencing an upsurge in the prevalence of the disease (Adeleke *et al.*, 2010). Insulin resistance (IR) arising from obesity has been observed to be one of the causes (Grill *et al*., 2008). Vitamin D insufficiency has been implicated in IR (secretion and action) and ultimately type 2 DM (Pittas *et al.,* 2007). The deficiency of Vitamin D too has been implicated in the pathogenesis of cardiovascular complication, one of the leading causes of morbidity in diabetic subjects (Suzuki *et al.,*2006; Abudewood *et al.,* 2018). The current study was aimed at evaluating serum vitamin D levels in type 2 DM in one of the fastest growing cities in Africa, Abuja, Nigeria. This is to provide preliminary report on the status of Vitamin D in diabetic and non-diabetic Nigerians in Abuja as there is paucity of data in Northern Nigeria.

Materials and Methods
Subjects
Eighty-eight (88) consecutive subjects were recruited for the study. This was made up of 53 type 2 diabetic patients (23 males, 30 females) attending the diabetic clinic at the University of Abuja Teaching Hospital, Gwagwalada. Full medical histories of the recruited subjects were recorded including weight, height and blood pressure measurements. Thirty-five (35) apparently healthy subjects (13 males, 22 females) served as controls. They were drawn from the University of Abuja Teaching Hospital staff and Gwagwalada environs. Their age range was 30-70years. All subjects who declined consent were excluded from the study.

Specimen Collection
Ten (10) mls of fasting (12-14h) venous blood

were collected from each subject by venipuncture using a 10ml syringe and 22G needle after sterilization of the punctured area with 70% alcohol. Three (3) mls of the blood were carefully dispensed into an EDTA specimen bottle appropriately labelled for the subject and gently mixed by inversion for the measurement of glycated haemoglobin (HbAIC). The remaining 7mls were dispensed into plain blood sample bottle appropriately labelled for the subject. This was allowed to clot at room temperature and the serum extracted after spinning in the centrifuge at 3000rpm for 5minutes. After glucose estimation, the remaining serum samples were stored frozen at -20°C till analysis of vitamin D.

Analytical Methods

Fasting blood glucose (FBG) was estimated using enzymatic glucose oxidase – peroxidase technique (Trinder, 1969). Glycated haemoglobin was measured using the micro column technique (Trivellier *et al.,* 1971). Vitamin D was measured by the enzyme linked in immunosorbent assay (ELI SA) (Rischet *et al*., 2006).

Body mass index (BMI) was calculated from: weight (kg) (WHO, 2006)

height (m^2)

Statistical Analysis

The data obtained were analyzed using statistical package for social sciences (SPSS) windows version 15. Students` t-test was used to compare means and Pearson correlation coefficient to evaluate relationships. A p-value of equal to or less than 0.05 ($p< 0.05$) was considered as statistically significant.

Results

Table 1 shows the mean values of age and BMI in diabetic and non diabetic subjects. The mean age of the diabetic subjects was significantly higher ($p<0.05$) than similar values in the controls. On the other hand, the mean values of BMI in both diabetic and control subjects were similar ($p>0.05$). Table 2 shows the results of the mean values of age and BMI in diabetic patients according to gender. The values of the two parameters in both males and females is similar ($p>0.05$). The mean value of age and BMI for control subjects are shown in table 3. There was no significant difference in both parameters for male and female ($p>0.05$). Table 4 shows the results of mean values of glucose and HbA1C in diabetic and non diabetic controls. The mean value of both analyses was significantly higher ($p<0.05$) in diabetic patients than controls. The mean values of vitamin D in diabetic patients and controls and its reference limits in controls are shown in table 5. The mean value of vitamin D was significantly lower ($p<0.05$) in diabetic patients compared to controls. Twenty-four diabetic patients (43.3%) had vitamin D levels less than 30ng/ml. Sixteen were females (30.2%) while eight (15.1%) were males. However, the mean values of vitamin D in the males and females were similar ($p>0.05$). Table 6 shows the mean vitamin D levels in diabetic patients with good and poor glucose controls. The value in patients with good control was higher than the value in patients with poor controls even though they were not statistically significant ($p>0.05$). Table 7 shows the man values of vitamin D in diabetic patients with good and poor HbA1c controls. The values were similar in both good and poor controls ($p>0.05$). The mean values of vitamin D and lipid profile in obese and non obese diabetic patients are shown in table 8. All the values are not statistically different ($p>0.05$). However, vitamin D value in the obese was lower than similar value in the non-obese. The correlation between vitamin D and clinical parameters in all the subjects are shown in table 9. There were no significant correlations ($p>0.05$) between vitamin D and all the parameters.

Table 1: Age and BMI (Mean + SEM) in diabetic patients and controls

Subjects	n	Age (years)	BMI (kg/m^2)
Diabetic patients	53	52.5+1.41	27.7+0.79
Controls	35	39.9+1.83	26.09+1.08
p- value		0.00	0.214

Key:
SEM: standard error of mean
n: number of subjects
BMI: body mass index
p<0.05 is significantly different

Table 2: Age and BMI (Mean + SEM) in diabetic patients according to gender

Subjects	n	Age (years)	BMI (kg/m^2)
Male	23	53.78+2.56	26.29+1.09
Female	30	51.53+1.54	28.75+1.09
p- value		0.434	0.124

Key
SEM: standard error of mean
n: number of subjects
BMI: body mass index
p<0.05 is significantly different

Table 3: Age and BMI (Mean + SEM) in control subjects according to gender

Subjects	n	Age (years)	BMI (kg/m^2)
Male	13	40.31+3.28	25.65+2.34
Female	22	39.68+2.24	26.28+1.08
p- value		0.87	0.786

Key
SEM: standard error of mean
n: number of subjects
BMI: body mass index
p<0.05 is significantly different

Table 4: Serum glucose and blood HbA1c (Mean + SEM) in diabetic patients and controls

Subjects	n	Glucose (mmol/l)	HbA1c (%)
Diabetic patients	53	8.7+0.38	6.5+0.41
Controls	35	4.6+0.08	4.3+0.11
p- value		0.000	0.000

Key
SEM: Standard error of error
HbA1c: Glycated haemoglobin
n: number of subjects
p<0.05

Table 5: Serum vitamin D levels (Mean + SEM) in diabetic patients and its reference limits in controls

Subjects	n	Vit D(ng/ml)	Ref. limits ($\overline{X}$ + 2SD)
Diabetic patients	53	42.1+5.0	30.0 − 339.0
Controls	35	184.5+13.06	
P value		0.000	

Key
$\overline{X}$: Mean
SD: Standard deviation
n: number of subjects
SEM: Standard error of mean
Ref: Reference

Table 6: Serum vitamin D levels (Mean + SEM) in diabetic patients with good and poor glucose control

Diabetic patients	n	Vitamins D (mg/ml)
Good control(<6.0mm/l)	29	44.28+6.6
Poor control(>6.0mm/l)	24	38.017+7.76
p-value		0.64

Key
SEM: Standard error of mean
n: number of subjects

Table 7: Serum vitamin D levels (Mean + SEM) in diabetic patients with good and poor HbA1c control

Diabetic patients	n	Vitamins D (mg/ml)
Good control (<6.0%)	28	44.31+6.84
Poor control (>6.0%)	25	39.71+7.44
p- value		0.648

Key
SEM: Standard error of mean
n: number of subjects

Table 8: Serum vitamin D levels (Mean + SEM) in obese and non-obese diabetic patients

Diabetic patients	n	Vit D (mg/ml)
Obese	16	33.5+5.49
Non-obese	37	45.9+6.71
p- value		0.25

Key:
SEM: Standard error of mean
n: number of subjects
Vit-D: Vitamin D

Table 9: Correlation between vitamin D and other parameters

Independent variables	Diabetics (r)	Diabetics (p)	Controls (r)	Controls (p)
BMI	-0.19	0.18	0.022	0.9
HbA1c	0.069	0.63	-0.039	0.823

Key:
BMI – Body Mass Index
HbA1c – Glycated haemoglobin
p<0.05

Discussion

The significant low level of vitamin D in our diabetic patients compared to controls is in agreement with the reports of Al Shaikh *et al*. (2016) and Anyanwu *et al*. (2016). The mechanism for the reduced vitamin D levels in diabetic patients is not well understood. Vitamin D is said to play a significant role in the secretion and action of insulin (Van Driel *et al.,* 2006). The reduced levels could contribute to the development of type 2 DM and complications (Suzuki *et al.,* 2006, Abudawood *et al.,* 2012). Women seem to be at a higher risk of developing type 2 DM and its complications from our results. This is in agreement with the report of Abudawood *et al*. (2012).

Type 2 diabetic patients may benefit from Vitamin D supplementation (Pittas *et al.,* 2007). Poor glycaemic status did not play major role with reduced level of vitamin D in our diabetic subjects contrary to the report of Boddamawi *et al.* (2013). Our results also indicate that obesity does not significantly affect the level of vitamin D in our diabetic subjects. This is contrary to the observation of McGill *et al.* (2008).

Recommendation

There is need to do further studies using a larger sample size.

References

Abudawood, M., Tabassum, H., Ansar, S., Almosa, K., Sobki, S., Ali, M.N., Aljohi, A. (2018). Assessment of gender related differences in vitamin D levels and cardiovascular risk factors in Saudi patients with type 2 diabetes mellitus. Saudi Journal of Biological Science;**25(1)**:31-36.

Adeleke, S.I., Asani, M.O., Belonwu, R.O., Gwarzo, G.D., Farouk, Z.L. (2010): Childhood diabetes mellitus in Kano, North West, Nigeria. *Nigerian Journal of Medicine; **19***:145-147.

Al Shaikh, A., & Al Zahrani, A. M. (2016). Impact of Vitamin D Status on Cardiometabolic Complications among Children and Adolescents with Type 1 Diabetes Mellitus. *Journal of Clinical Research in Pediatric Endocrinology; **8*(1)**: 48–54. https://doi.org/10.4274/jcrpe.2266.

Anyanwu, A.C. (2016). Effect of vitamin D supplementation on glycaemic control type 2 diabetic subjects in Lagos, Nigeria. *Indian Journal of Endocrinology ;**20 (2)***: 159 – 194.

Baddamani, G.B., Boke, U., Kora, S., Chickmath, R. (2013): Inverse correlation between HbA1C and vitamin D. *Journal of Applied Medical Science; **1(6)***: 786-788.

Pittas, A.G., Harris, S.S., Stark, P.C. and Dawson-Hughes, B. (2007). The effects of calcium and vitamin D supplementation on blood glucose and markers of inflammation in nondiabetic adults. *Diabetes Care; **30(4)***: 980-986.

Citation: Oko, C.B., Anaja, P.O., Nwaelugo, R.A. and Okafor, P.A. Serum Vitamin D Levels Among Type 2 Diabetic Patients in Nigeria: Preliminary Findings. ***Sokoto Journal of Medical Laboratory Science; 7(1): 38 - 43.***