

Correlation Of Sialic Acid Levels With Lipid Profile And Anthropometric Variables In Type 2 Diabetes Mellitus And Diabetic Nephropathy

ABSTRACT

AIMS: TO STUDY THE CORRELATION BETWEEN SIALIC ACID LEVELS WITH LIPID PROFILE AND ANTHROPOMETRIC VARIABLES IN TYPE 2 DM (DIABETES MELLITUS) AND DN (DIABETIC NEPHROPATHY).

STUDY DESIGN: CASE CONTROL STUDY

PLACE AND DURATION OF STUDY: STUDY WAS CONDUCTED AT DEPARTMENT OF BIOCHEMISTRY AND DEPARTMENT OF MEDICINE AT AJ INSTITUTE OF MEDICAL SCIENCES, MANGALORE FOR A PERIOD OF 2 YEARS.

METHODOLOGY: STUDY POPULATION INCLUDED 75 SUBJECTS IN THE AGE GROUP OF 40-70 YEARS OUT OF WHOM 25 SUBJECTS WERE TYPE 2 DM, 25 SUBJECTS WERE DN AND 25 WERE AGE AND SEX MATCHED NORMAL CONTROLS. SERUM AND URINE SIALIC ACID, LIPID PROFILE AND ANTHROPOMETRIC VARIABLES WERE MEASURED IN STUDY SUBJECTS.

RESULTS: KARL PEARSON CORRELATION TEST WAS USED TO DETERMINE THE CORRELATION. SERUM AND URINE SIALIC ACID SHOWED A POSITIVE CORRELATION WITH TOTAL CHOLESTEROL TRIGLYCERIDES, LDL-C AND BODY MASS INDEX (P VALUE <0.001) WHICH WAS STATISTICALLY SIGNIFICANT IN BOTH DM AND DN WHEN COMPARED WITH CONTROLS. SERUM AND URINE SIALIC ACID SHOWED A NEGATIVE CORRELATION WITH HDL-C (P VALUE <0.001) WHICH WAS STATISTICALLY SIGNIFICANT IN BOTH DM AND DN WHEN COMPARED WITH CONTROLS. SERUM AND URINE SIALIC ACID SHOWED A POSITIVE CORRELATION WITH WAIST HIP RATIO BUT IT WAS NOT STATISTICALLY SIGNIFICANT.

CONCLUSION: LOW GRADE INFLAMMATION IS IMPLICATED IN THE CAUSATION AND PROGRESSION OF TYPE 2 DM AND ITS COMPLICATIONS. SIALIC ACID CAN BE CONSIDERED AS A MARKER FOR ACUTE PHASE RESPONSE AND IS PREDICTED AS A RISK FACTOR FOR COMPLICATIONS OF TYPE 2 DM.

32 KEYWORDS: DIABETES MELITUS, DIABETIC NEPHROPATHY, SIALIC ACID, BODY MASS
33 INDEX, WAIST HIP RATIO

34 Introduction

35 Type 2 DM (Diabetes Mellitus) is a disorder resulting from deficiency of insulin secretion or decrease
36 in its biological action or both and is associated with chronic hyperglycemia. ⁽¹⁾ Hyperglycemia
37 observed in type 2 dm results in significant damage of different target organs ⁽²⁾

38 Low grade inflammation plays a potential role in the causation and progression of complications in
39 type 2 DM. ⁽³⁾

40 Sialic acid [sa], a derivative of neuraminic acid, is an important constituent of glycolipids and
41 glycoproteins. It acts as a co-factor of different cell receptors and is positively associated with most of
42 the serum acute phase reactants which are considered as the indicators of microvascular angiopathy
43 in type 2 dm. ⁽⁴⁾ Sialic acid is present as the terminal sugar of the oligosaccharide chain in majority of
44 the acute phase proteins (e.g. fibrinogen and haptoglobin) , thus sialic acid can be used as a
45 measure of acute-phase response. ⁽⁵⁾

46 "Serum sialic acid" is a recently recognized possible risk factor for the rise of "macro and
47 microvascular complications of type 2 DM. ⁽⁶⁾

48 The present study aimed to correlate sialic acid levels with lipid profile, body mass index (bmi) and
49 waist hip ratio (WHR) in type 2 DM and DN.

50 Materials and methods

51 The study population included the following groups:

52 Group I: Known cases of Type 2 DM without any complications (25)

53 Group II: Known cases of DN (25)

54 Group III: Healthy controls who were age and sex matched (25)

55 Selection criteria:

56 Inclusion criteria: Known cases of type 2 dm without any complications and DN aged between 40-70
57 years.

58 Exclusion criteria: Subjects with history of inflammatory disorders, malignancy, alcohol intake,
59 smoking , pregnancy and cardiac disease

60 Ethical considerations: Approval by the institutional ethical committee was obtained. The objectives of
61 the study were explained to all eligible subjects who participated in the study. Informed consent was
62 sought from all participants.

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64 Sample collection: After 8-12 hours of fasting 7 ml of blood was collected by aseptic precautions,
65 after obtaining the informed consent. . Blood was collected in plain vacutainer (5ml). Urine sample
66 (5ml) was also collected in a sterile and dry container. Serum was obtained after processing the blood
67 collected in plain vacutainer.

68 Serum and urine sialic acid: Measured by ehrlich's reagent in spectrophotometer using commercially
69 available kits.

70 Total cholesterol (TC): Measured by enzymatic method chod-pap (cholesterol oxidase-peroxidase 4-
71 aminoantipyrine) in semiautoanalyzer using commercially available kit.

72 HDL-c : Measured by enzymatic method after precipitation with polyanions in a semiautoanalyzer
73 using commercially available kit.

74 LDL-c : Calculated by Friedewald formula

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$$\text{LDL cholesterol mg/dl} = \text{Total cholesterol} - [\text{HDL cholesterol} + \text{Triglycerides}/5]$$

76 Triglycerides: Measured by enzymatic method GPO-ESPAS (glycerol 3 phosphate oxidase-
77 peroxidase n-ethyl-n-sulfopropyl-n-anisidine) using commercially available kit in semiautoanalyser

78 BMI: Calculated as $\text{weight (kg)} / \text{height}^2 \text{ (m)}$

79 Waist circumference (WC): Measured in the midway section between the iliac crests and the lower
80 margin of the ribs at minimal respiration.

81 Hip circumference (HC): Measured at the level of greater trochanter.

82 WHR: WC divided by the HC

83 **Statistical analysis:**

- 84 • Karl pearson correlation test was used to find the correlation sialic acid levels with lipid
85 profile and anthropometric variables in type 2 diabetics without complications and in dn
- 86 • SPSS software was used to analyse the data.

87 **Results and Discussion:**

88 **Table 1: Correlation of serum sialic acid with lipid profile and anthropometric indices in type 2**
89 **diabetics without any complications**

Serum sialic acid	K.P	Total cholesterol (TC)	Triglycerides (TG)	HDL-c	LDL-c	BMI	WHR
	r	0.96	0.92	-0.73	0.95	0.78	0.35
	P	<0.001	<0.001	<0.001	<0.001	<0.001	0.087
	n	25	25	25	25	25	25

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91 In type 2 DM, it showed a positive correlation between serum sialic acid and TC, TG, LDL-c and BMI
92 which was statistically significant. Serum sialic acid showed a negative correlation with HDL-c which
93 was statistically significant. Similarly serum sialic acid showed a positive correlation with WHR but it
94 was not statistically significant (Table 1).

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Table 2: Correlation of serum sialic acid with lipid profile and anthropometric indices in DN

Serum sialic acid	K.P	Total cholesterol	Triglycerides	HDL-c	LDL-c	BMI	WHR
	r	0.97	0.86	-0.90	0.97	0.90	0.17
	P	<0.001	<0.001	<0.001	<0.001	<0.001	0.396
	n	25	25	25	25	25	25

In DN it showed a positive correlation between serum sialic acid and TC, TG , LDL-c an BMI which was statistically significant. Serum sialic acid showed a negative correlation with HDL-c which was statistically significant . Similarly serum sialic acid showed a positive correlation with WHR but it was not statistically significant (Table 2)

Table 3: Correlation of urine sialic acid with lipid profile and anthropometric indices in type 2 diabetics without any complications

Urine sialic acid	K.P	Total cholesterol	Triglycerides	HDL-c	LDL-c	BMI	WHR
	r	0.95	0.88	-0.72	0.94	0.80	0.31
	P	<0.001	<0.001	<0.001	<0.001	<0.001	0.128
	n	25	25	25	25	25	25

In type 2 DM it showed a positive correlation with TC, TG, LDL-c and BMI which was statistically significant. Urine sialic acid showed a negative correlation with HDL-c which was statistically significant .Similarly urine sialic acid showed a positive correlation with WHR but was not statistically significant. (Table 3).

Table 4: Correlation of urine sialic acid with lipid profile and anthropometric indices in DN

Urine sialic acid	K.P	Total cholesterol	Triglycerides	HDL-c	LDL-c	BMI	WHR
	r	0.96	0.88	-0.88	0.95	0.92	0.23
	P	<0.001	<0.001	<0.001	<0.001	<0.001	0.279
	n	25	25	25	25	25	25

In DN it showed a positive correlation with TC, TG, LDL –c and BMI which was statistically significant. Urine sialic acid showed a negative correlation with HDL –c which was statistically significant. Similarly urine sialic acid showed a positive correlation with WHR but was not statistically significant. (Table 4)

Recent studies have shown an interrelationship between inflammation, adiposity and diabetes. Inflammatory markers may be used as a sensitive marker for the assessment of microvascular complications in type 2 DM .

In the present study, there was a significant positive correlation of sialic acid levels with TC. It showed a significant negative correlation with HDL-c in both type 2 DM and DN. Similar findings were found in a study conducted by Chen J et al⁽⁷⁾.

Levels of sialic acid showed a significant positive correlation with TG and LDL-c in both type 2 DM and DN. Similar findings were observed in a study conducted by Nayak SB et al⁽⁸⁾.

Sialic acid also showed a positive correlation with BMI and WHR in both type 2 DM and DN. Similar observations were found in study conducted by Nayak SB et al⁽⁴⁾. Dyslipidemia and obesity are the cardiovascular risk factors. Hence these patients may have underlying microvascular complications and this may explain the correlation of sialic acid with lipid profile and anthropometric indices.

CONCLUSION

The present study showed a statistically significant positive correlation between sialic acid levels with TC, TG, LDL-c and BMI. A statistically significant negative correlation was seen between sialic acid level with HDL-c. A positive correlation was seen between sialic acid level with WHR but it was not statistically significant.

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- ABBREVIATIONS
- BMI- Body Mass Index
- DM- Diabetes Mellitus
- DN- Diabetic Nephropathy
- HC-Hip Circumference
- HDL-c -High Density lipoprotein - cholesterol
- KP-Karl Pearson
- LDL-c- Low Density Lipoprotein- cholesterol
- TC- Total Cholesterol
- TG-Triglycerides
- WC-Waist Circumference
- WHR-Waist Hip Ratio