

Concentrations of the Vitamin D Metabolite 1,25(OH)₂D and its relationship to inflammatory and metabolic parameters in diabetes type 2

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BACKGROUND

While 25-hydroxy-vitamin D (25(OH)D) has been thoroughly investigated, the role of active vitamin D metabolite 1,25(OH)₂D in a metabolic syndrome still remains unclear.

OBJECTIVE

The aim of our study was to determine the association between 25(OH)D and 1,25(OH)₂D levels and several metabolic parameters and inflammatory markers in postmenopausal women with diabetes type 2 (T2DM).

RESULTS

Serum 25(OH)D concentrations were highest in the lean diabetics compared with obese diabetics and control subjects ($p < 0,0007$) and were significantly associated with fasting glucose, insulin, HOMA-B, BMI and PAI-1. In diabetic patients 25(OH)D levels were positively associated with HDLC ($p < 0,01$) and negatively with triglycerides ($p < 0,04$) and PAI-1 ($p < 0,001$). Serum 1,25(OH)₂D concentrations were significantly higher in control obese subjects ($77,4 \pm 17,0$ nmol/l) compared with adipose diabetics ($p < 0,001$), with no difference in relation to lean diabetics. Fasting glucose and HbA1c negatively correlated ($p < 0,01$), whereas cholesterol and LDLC positively correlated ($p < 0,01$) with 1,25(OH)₂D. Furthermore, 25(OH)D correlated with PAI-1 in all subjects while 1,25(OH)₂D correlated with fibrinogen but only in obese control subjects.

METHODS

Anthropometric variables, serum 25(OH)D, 1,25(OH)₂D, C-reactive protein (CRP), fibrinogen, PAI-1, fasting glucose, fasting insulin, and HbA1c were measured in 125 postmenopausal women with T2DM. Insulin resistance was estimated by homeostasis model assessment-HOMA-IR and beta-cell function by HOMA-B. A total of 125 diabetic patients were divided by BMI in normal weight group ($n=22$, BMI $22,7 \pm 1,5$ kg/m²) and adipose group ($n=93$, BMI $32,2 \pm 5,8$ kg/m²). Control group consisted of healthy obese postmenopausal women ($n=46$, BMI $34,9 \pm 6$ kg/m²).

Table 1. Baseline characteristics of study subjects

	T2DM obese	T2DM Normal weight	Control group Obese group	p
n	93	22	46	
Age (yr)	64,7±9,5	65,6±9,7	58,1±9,4	0,0007
Waist circumference(cm)	100,6±11,4	85,5±7,6	102,9±12,9	0,0000
BMI (kg/cm ²)	32,2±5,8	22,7±1,5	34,9±6,1	0,0000
Fasting glucose (mmol/l)	12,1±3,9	11,3±4,9	4,9±0,7	0,0000
HbA1c (%)	10,0±2,2	10,4±1,9	5,90±0,25	0,0000
Fasting insulin (mIU/l)	11,9±8,7	6,8±4,2	14,4±11,2	0,0000
HOMA-IR	6,3±3,5	3,5±1,6	2,9±1,4	0,0000
HOMA-B	54,9±103,8	70,2±95,3	214,3±139,3	0,0000
Cholesterol (mmol/l)	5,24±1,44	5,36±1,26	6,37±1,32	0,0000
Triglycerides (mmol/l)	2,36±1,22	1,38±0,61	1,81±1,15	0,0002
HDL -C (mmol/l)	1,20±0,27	1,41±0,31	1,41±0,31	0,0002
LDL -C (mmol/l)	3,04±1,23	3,29±1,12	4,22±1,15	0,0000
25(OH)D (nmol/l)	59,7±30,7	80,13±42,8	48,51±21,6	0,008
PAI-1 (U/l)	4,05±2,03	2,67±1,18	3,47±1,91	0,011
Fibrinogen	4,17±0,9	4,04±0,76	3,84±0,85	NS
CRP (nmol/l)	3,6±2,3	2,6±2,8	4,5±2,6	0,01

25(OH)D	DM R	DM p	Control group	All subjects
GUK	,156	NS	NS	0,251 0,004
BMI	-0,186	0,032	NS	-,2334 0,003
Insulin	-,186	0,04	NS	-,1960 0,012
HOMA-B	-,209	0,053	NS	-,2885 0,001
HDL	,2408	0,01	NS	,141 0,069
trigliceridi	-,194	0,04	NS	
PAI-1	-,3065	0,001	NS	-,2350 0,003

Correlation of 25(OH)D 1 and 25(OH)₂D with metabolic and inflammatory parameters

1,25(OH) ₂ D	DM R	DM p	Control group	All subjects
GUK	NS	NS	NS	-,2508 0,005
HOMA-B	NS	NS	NS	,1970 0,031
kolesterol	NS	NS	NS	,2182 0,009
LDL	NS	NS	NS	,2525 0,002
fibrinogen	NS	-,3197	0,031	
HbA1c	NS	NS	NS	-,2816 0,001

CONCLUSION

Conclusions: In type 2 diabetic women low serum 25(OH)D and 1,25(OH)₂D levels were associated with atherogenic dyslipidemia, glucose parameters and low grade inflammation. The active hormonal form of vitamin D, 1,25(OH)₂D correlated with cholesterol, LDLC and fibrinogen, while 25(OH)D correlated with triglycerides, HDLC and PAI-1, suggesting that there may be an independent mechanism of action for 1,25(OH)₂D in relation to metabolic dysregulation.

