

**The relationship between Vitamin D deficiency,  
Haemoglobin A1C and their association with  
Microvascular and Macrovascular complications in  
patients with Type 2 Diabetes Mellitus**

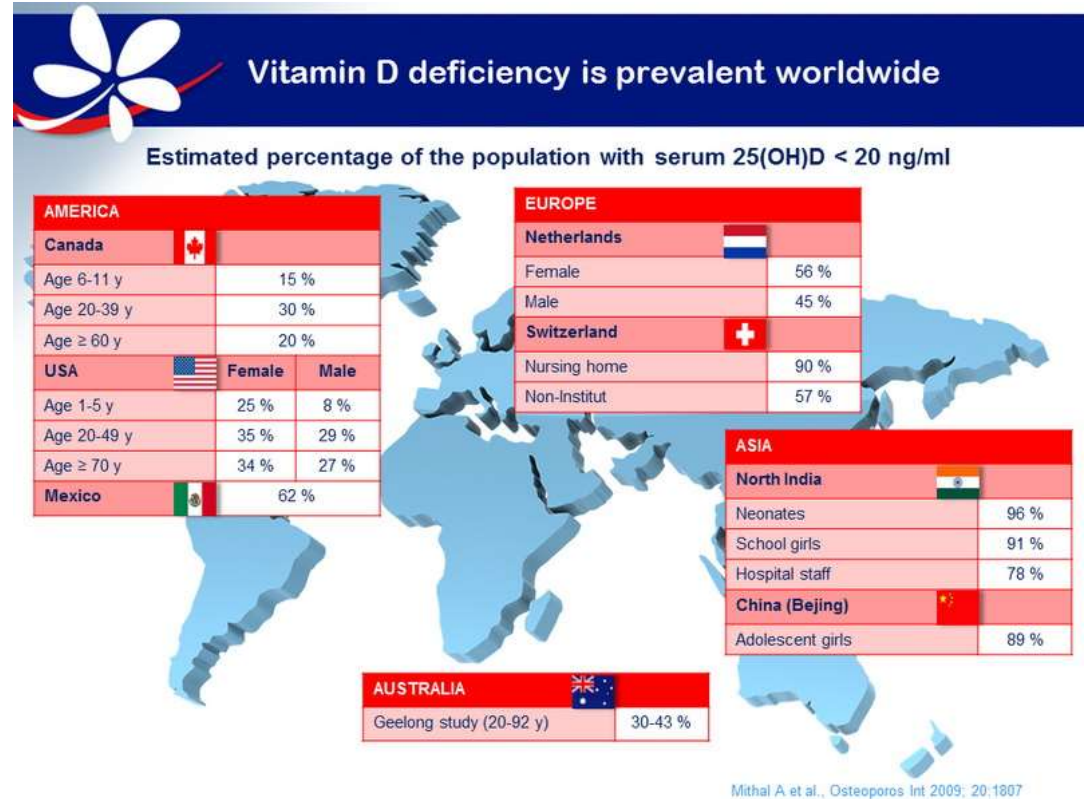
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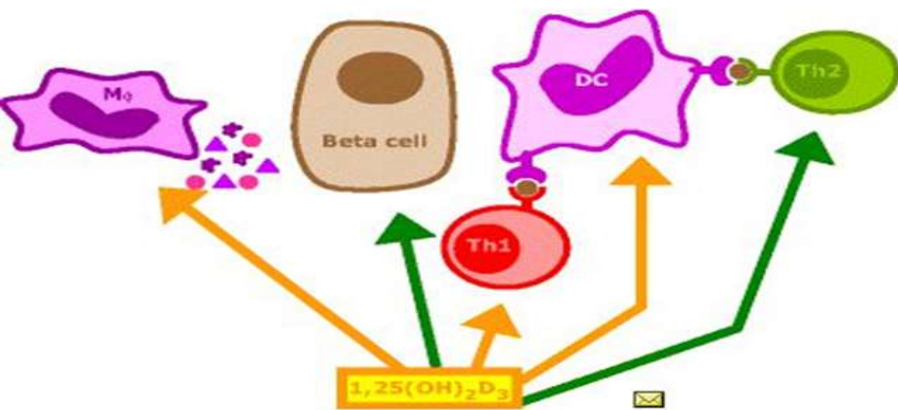
BIRDEM General Hospital

# Prevalence of Vitamin D deficiency worldwide

- Silent epidemic and highly prevalent
- 1 billion people worldwide have vitamin D deficiency or insufficiency[1]
- Vitamin D deficiency is thought to be an important contributing factor in the pathogenesis of non communicable diseases.
- Vitamin D deficiency increases insulin resistance and impairs insulin secretion.



# Vitamin D and diabetes



The metabolically active form of vitamin D, 1,25(OH)<sub>2</sub>D<sub>3</sub>, and its analogues have been shown to have effects on the major players involved in the pathogenesis of type 1 and type 2 diabetes. Beta cell function has been shown to be improved by 1,25(OH)<sub>2</sub>D<sub>3</sub> in vitro and in vivo, and the avoidance of vitamin D deficiency is essential for normal beta cell function. In NOD mice, 1,25(OH)<sub>2</sub>D<sub>3</sub> protects against insulinitis, diabetes and disease recurrence after islet transplantation, primarily through immunomodulatory effects.

Review

**Vitamin D and diabetes**

**C. Mathieu et al, Diabetologia, 2005**

## **Objectives and Methods:**

- **Objectives:**

- To observe the level of vitamin D in diabetes mellitus patients.
- To establish correlation between glycaemic status and vitamin D deficiency.
- To explore association between vitamin D deficiency with microvascular and macrovascular complication.

- **Methods:**

- Study design: Retrospective, cross sectional study
- Study place: Endocrinology department (indoor) of BIRDEM general hospital
- Study period: January,2018-June,2018

## **Methods contd..**

- ..Study population: Diabetes mellitus patients with vitamin D deficiency admitted in Endocrinology inpatient.
- Sample size: 57 patients were enrolled in the study.
- Sampling technique: Convenient sampling

### **Inclusion criteria**

- Age > 18 yrs.
- Patients with type 2 Diabetes Mellitus who were subsequently diagnosed with low 25(OH) vitamin D level.

## Methods contd..

- **Exclusion criteria:**

- Patients receiving Vitamin D or calcium supplements

- Active infection

- Acute kidney injury

- Liver disease

- Primary hyperparathyroidism

- Osteoporosis

- Data were obtained from medical records which included detailed history, physical examination and laboratory findings .

- Diabetes mellitus was diagnosed by ADA criteria,2018 and HbA1c was measured by HPLC method

## Methods contd...

- Presence of microvascular and macrovascular complications was diagnosed by appropriate clinical examination and relevant laboratory findings.
- 25 (OH) vitamin D level was assessed using ELISA technique[2]
  - Deficiency <20 ng /ml
  - Insufficiency 21-29 ng /ml
  - Sufficient >30ng/ml
- SPSS 21 for Windows software(SPSS inc. Chicago,IL, USA) was used for data analysis.
- Correlation between Vitamin D and HbA1c was done by Pearson's correlation test.
- Chi square test was done to see the relation between microvascular and macrovascular complications with vitamin D level.

2. Dawson-Hughes B, Heaney RP, Holick MF, Lips P, Meunier PJ, Vieth R. Estimates of optimal vitamin D status. *Osteoporos Int* 2005;16:713-6

# Findings

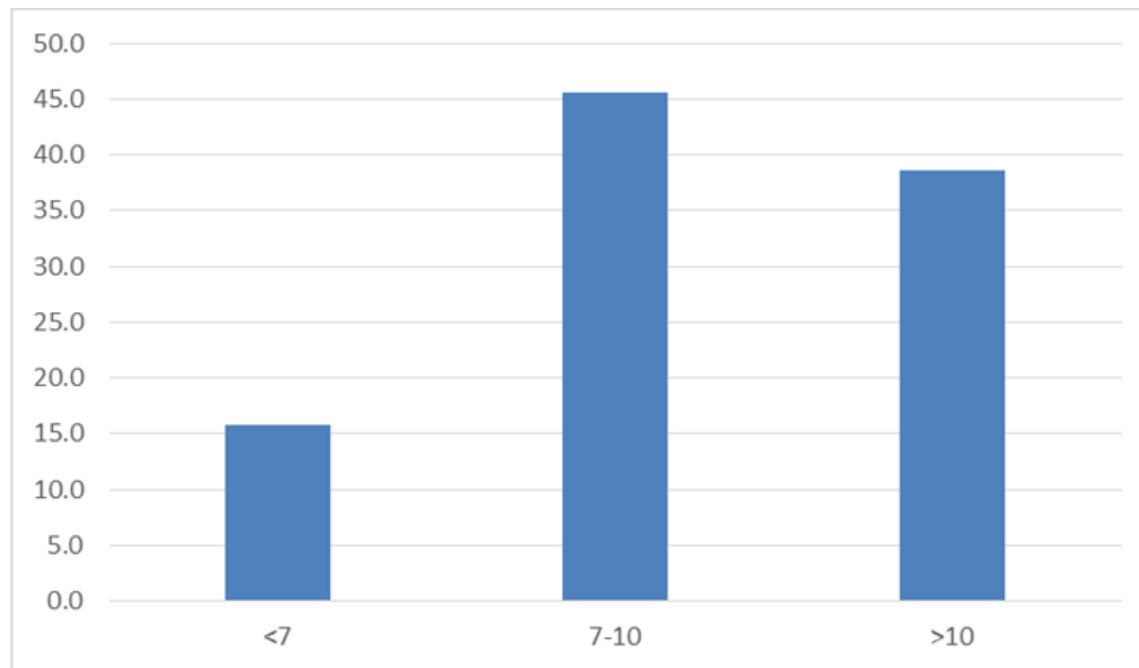
## Distribution of subjects by age, sex and serum 25(OH) vitamin D status(n=57)

Variable	Frequency	Percentage
<b>Age(years)</b>		
20-40	9	15.8
41-60	24	41.2
61-80	22	38.6
>80	2	3.5
<b>Gender</b>		
Male	16	28.1
Female	41	71.9
<b>25(OH) vitamin D status</b>		
Deficient	40	70.2
Insufficient	17	29.8



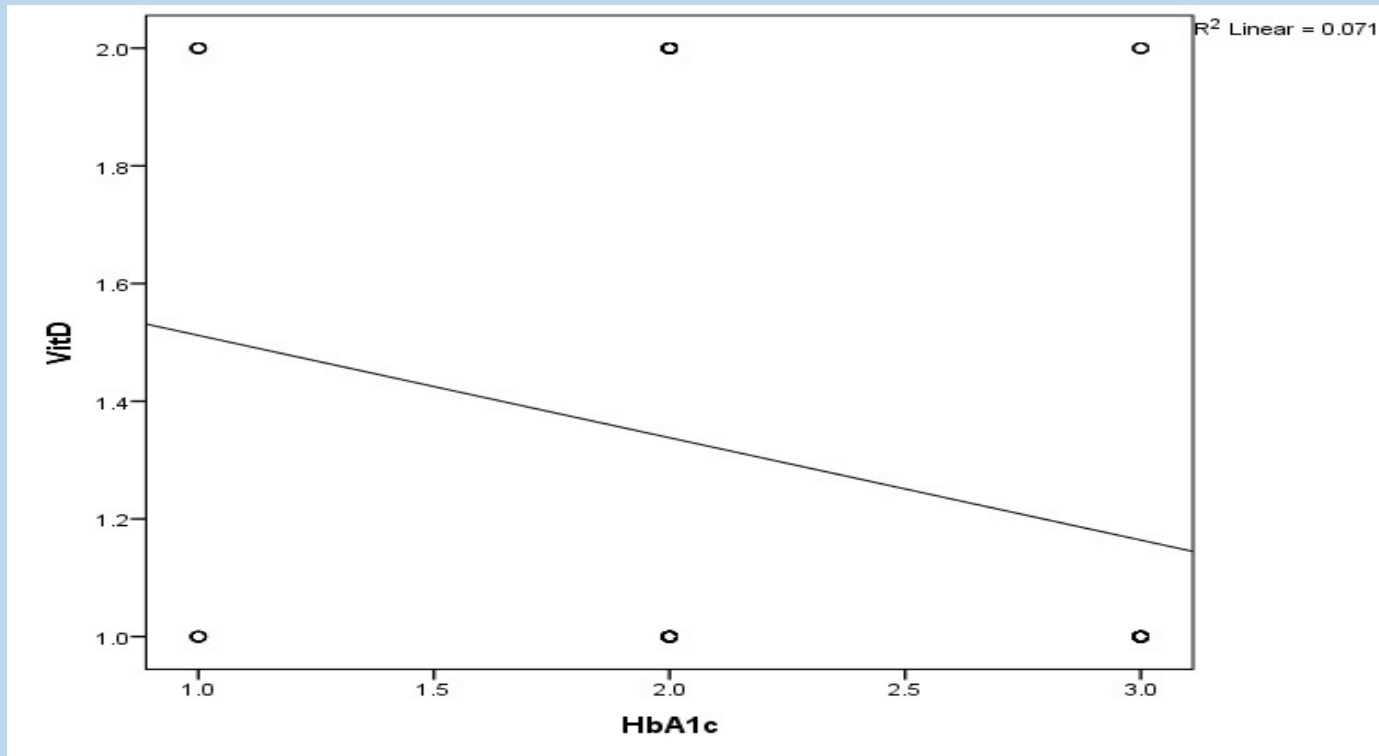
## Findings contd..

### Distribution of patients according to HbA1C level



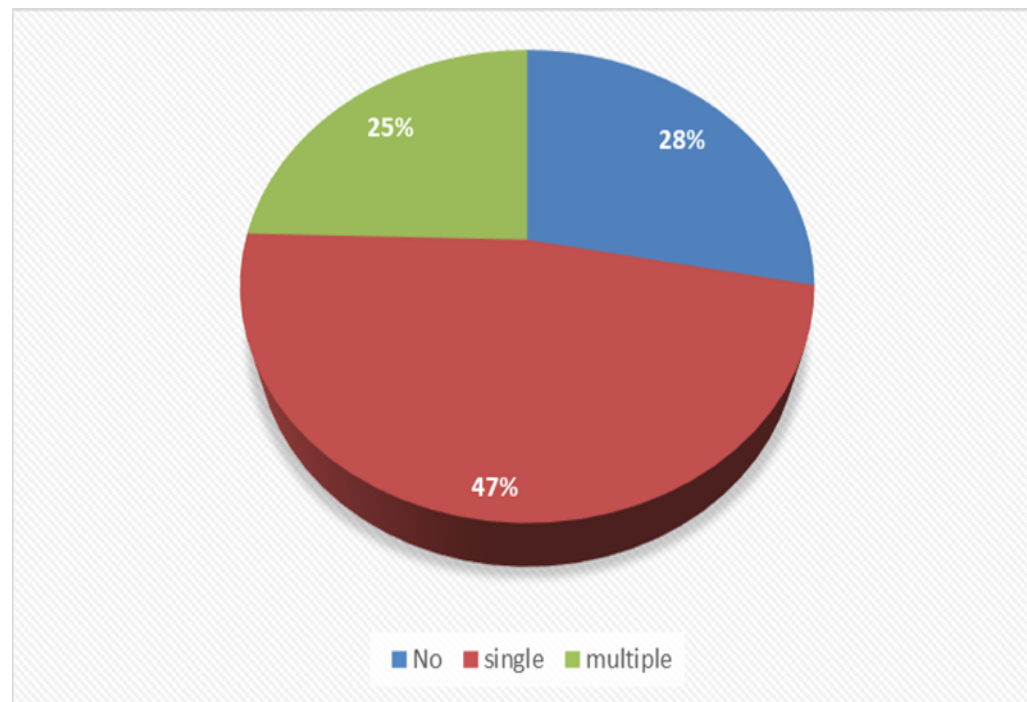
# Findings contd..

## Correlation between HbA1C and Vitamin D level



## Findings contd..

Distribution of patients according to complications



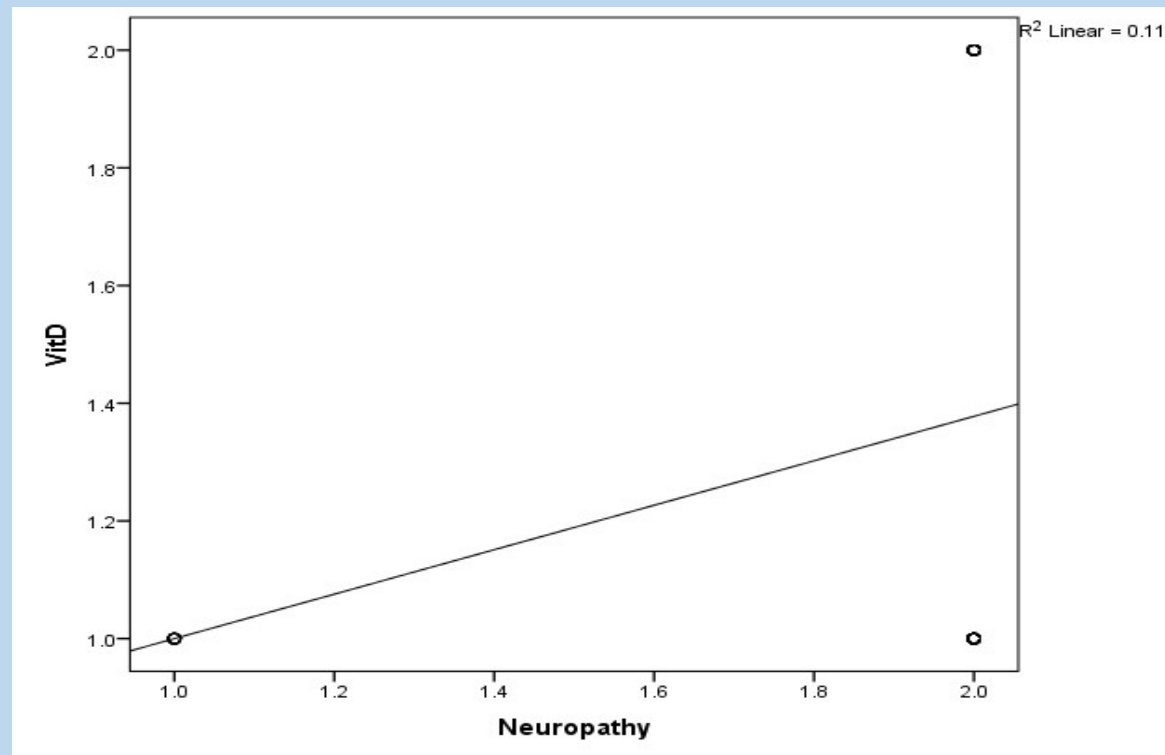
## Findings contd..

### Distribution of vitamin D deficient patients according to presence of complications

Complications	Presence	Vitamin D deficiency (N=40)	Vitamin D insufficiency (N=17)	Total (N=57)	P value
Retinopathy	Yes	6(10.5)	0(0)	6(10.5)	0.091
	No	34(59.6)	17(29.8)	51(89.5)	
Nephropathy	Yes	18(31.6)	4(7.0)	22(38.6)	0.128
	No	22(24.6)	13(22.8)	35(61.4)	
Neuropathy	Yes	12(21.1)	0(0)	12(21.1)	0.011**
	No	28(49.1)	17(29.8)	45(78.9)	
Ischaemic heart disease	Yes	13(22.8)	8(14.0)	21(36.8)	0.297
	No	27(47.4)	9(15.8)	36(63.2)	
Cerebrovascular disease	Yes	3(5.3)	1(1.8)	4(7.0)	0.827
	No	37(64.9)	16(28.1)	53(93.0)	
Peripheral vascular disease	Yes	1(1.8)	0(0)	1(1.8)	0.511
	No	39(68.4)	17(29.8)	56(98.2)	

## Findings contd..

### Correlation between Neuropathy and vitamin D level



## Discussion

- In this study, among 57 enrolled patients 72% were female and mean vitamin D level was 18.20 ng/ml . Around 70% patients were vitamin D deficient and 30% patients were vitamin D insufficient.
- In a study conducted among newly diagnosed type 2 diabetic patients,30% was found to be vitamin D deficient indicating better vitamin D status.[3]
- In our study, by Pearson's correlation coefficient a significant negative correlation was found between HbA1c and 25(OH) vitamin D level(P value = 0.045,r =-.267).

## Discussion contd..

- Another study done in South Asians in UK, HbA1c was higher ( $8.11 \pm 1.11\%$ ) in women with vitamin D deficiency ( $<12.5$  nmol/l) which also indicates negative correlation between HbA1c and hypovitaminosis D.[4]
- In this study a positive significant correlation was found between hypovitaminosis D and development of peripheral neuropathy ( $P=.011$ ,  $r=0.337$ ). Similar findings was supported by several other studies.
- A meta-analysis showed that Vitamin D deficiency was significantly associated with diabetic peripheral neuropathy in patients with type 2 diabetes mellitus.[5]
- A separate study showed that treatment with vitamin D can delay the onset of neuropathy.[6]

4. A.A. Tahrani, A Bali, L, Shepherd, A. Rahim, A.F. Jones, A. Bates. The prevalence of vitamin D abnormalities in South Asians with Type 2 diabetes Mellitus in UK

5. Lv WS, Zhao WJ, Gong SL, Fang DD, Wang B, Fu ZJ, et al. Serum 25-hydroxyvitamin D levels and peripheral neuropathy in patients with type 2 diabetes: a systematic review and meta-analysis. J Endocrinol Invest 2014, Dec 21. [Epub ahead of print]

6. Hehab D, Al-Jarallah K, Mojiminiyi OA, Al Mohamedy H, Abdella NA. Does Vitamin D deficiency play a role in peripheral neuropathy in Type 2 diabetes? Diabetic Med. 2012;29:43–9.

## Limitations

- Small sample size
- Single center study
- The general population of Bangladesh have been reported with low vitamin D level.[7] So it would be better to compare the level of vitamin D between general population and diabetic patients.

7. Md Zahirul Islam PhD<sup>1</sup>, Mohammed Akhtaruzzaman PhD<sup>2</sup> and Christel Lamberg-Allardt PhD, **Hypovitaminosis D is common in both veiled and nonveiled Bangladeshi women.** *Asia Pac J Clin Nutr* 2006;15 (1): 81-87



**THANK**

**YOU**

