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# Vitamin D levels in HIV infected patients and its correlation with severity of disease

# ***AIDS epidemic in India***

- Total > 40 Lakh people living with HIV/AIDS Prevalence - 0.31%
  - 2.5 lakh new infection every year (2000)
  - 1.2 lakh new infection every year (2009)
- Vulnerable groups and areas
  - ✓ Heterosexual- prostitute, truck drivers, single male migrants
  - ✓ Homosexual- eunuch, MSM
  - ✓ Injecting drug user, Iatrogenic
- **OI (opportunistic infection)** leading causes of deaths
- **Recent changes in trends of Mortality/Morbidity –**
  1. Atherosclerotic diseases
  2. Complications of ART
  3. Osteoporosis
  4. Depression and suicides

# *Significance of vitamin D in Health*

- **Sources** -direct sunlight/diet
- **Receptors** of vitamin D in body
  - Bone/Skeletal muscles
  - Brain/Prostate/ Breast/Colon
  - Immune cells
- **Causes of vitamin D deficiency**
  - Advanced age
  - Lack of sunlight exposure
  - Residence at higher altitude
  - Dark Skin pigmentation
  - Malnutrition
  - Obesity
  - Medications
- **Vitamin D Status in general population**
  - 36% / 57% in USA
  - 60% / 75% in India

# ***Role of vitamin D in IMMUNITY***

## ■ Vitamin D and immune system

- Innate and adaptive immunity
- Macrophage activation
- VDR' s (Vitamin D receptors)
- Effect on Toll like receptors & cathelicidin peptide IL-37
- Human defensin 2
- Decrease T cell proliferation

# *Vitamin D and HIV*

## ■ **Prevalence** of hypovitaminosis in HIV/AIDS

- ❖ Coodley et al (AIDS 1993) → 11%
- ❖ Kuehn EW (Germany 1999) → 45%
- ❖ Borderi- M (Italy 2011) → 7% & 54%
- ❖ Adeyemi (USA 2011) → 60%
- ❖ Mehtas (India 2012) → 66%

## ■ **Causes** of low vitamin D in HIV/AIDS patients

- Malnutrition
- ART/concomitant Infections
- Decreased sun exposure

## ■ **Affect** of hypovitaminosis-D on Health in these patients

- Osteoporosis and fractures
- Depression/Dementia
- CAD/PVD
- Increased OP's
- Anaemia

# *Aims and Objective*

- To study status of vitamin D levels in HIV infected individuals.
- To assess the correlation if any between levels of vitamin D and CD4 counts (i.e. severity of disease) and ART (Anti Retroviral Treatment) in these group of patients.

# *Material and Methods*

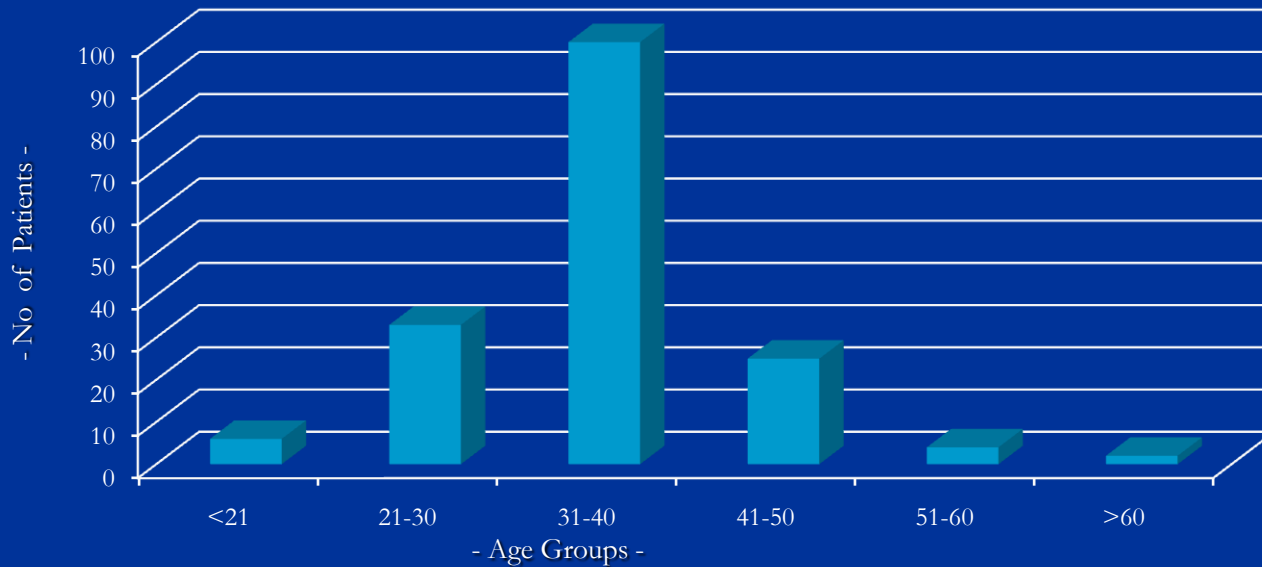
- **Study Design** – cross sectional, observational study
- **Study Place** – tertiary healthcare centre, PGIMER Dr RML Hospital  
New Delhi, India
- **Study group** – HIV patients with or without ART (Total 170 patients)
- **Study duration** – 70 weeks



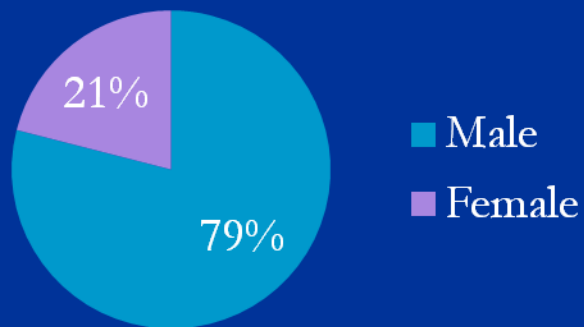
# *Material and Methods*

- **Inclusion criteria**- documented HIV infection confirmed by a series of 3 tests as per NACO guidelines
- **Exclusion criteria**- medications/type 2 diabetes / drugs/vitamin D supplementation/abnormal KFT or LFT
- **Definitions used** -
  - a) Vitamin D deficiency -25-OH Vitamin D levels < 20 ng/ml
  - b) Vitamin D insufficiency -25-OH levels 21-29 ng/ml

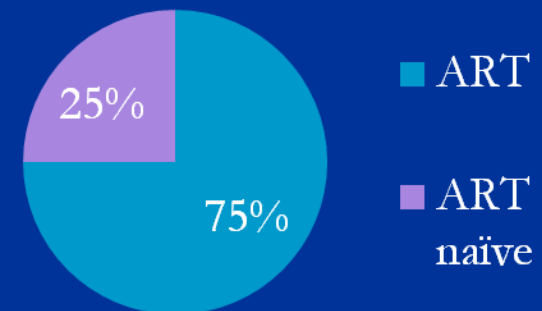
# Observations and Result



Distribution of patients in age groups



Sex distribution of patients



Proportion of patients on ART

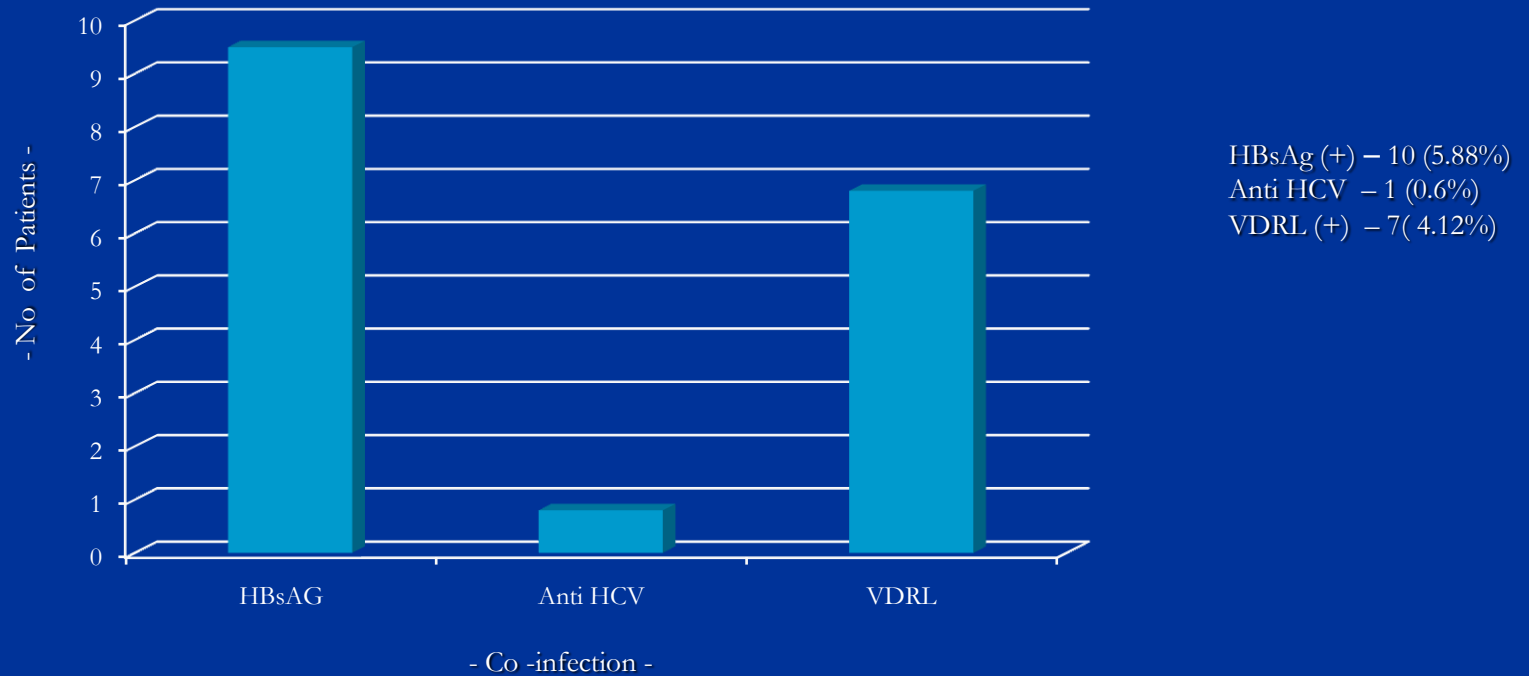
Total Patients – 170 [134 (79%) males & 36 (21%) females]

# *Observations & Result continued..*

Characteristic	Minimum	Maximum	Mean	Std deviation
Age (years)	19	70	35.54	8.04
Duration of disease (years)	00	13.00	2.28	2.09
SBP (mmHg)	100	134	115.71	9.31
DBP (mmHg)	60	84	75.09	5.75
HB (gm/dl)	4.70	16.00	11.07	2.32
Urea (mg /dl)	12.00	65.00	24.39	9.28
S. creatinine (mg/dl)	0.30	1.50	0.79	0.22
FBG (mg/dl)	50.00	123.00	87.64	12.77
PPBG (mg/dl)	112.00	186.00	136.41	12.40
Total cholesterol (mg/dl)	34.00	425.00	148.51	53.05
Triglyceride (mg/dl)	10.00	714.00	149.38	98.16
LDL (mg/dl)	16.00	199.00	91.08	32.42
VLDL (mg/dl)	10.00	144.00	30.83	16.25
HDL (mg/dl)	12.20	94.00	37.04	14.20
Calcium (mg/dl)	5.70	10.70	8.39	0.78
CD4 Counts(mm <sup>3</sup> )	3.00	1141.00	249.30	186.74
Vitamin D ( ng/ml)	3.44	31.20	11.26	5.49

Characteristics of patients

# *Observations & Result continued..*



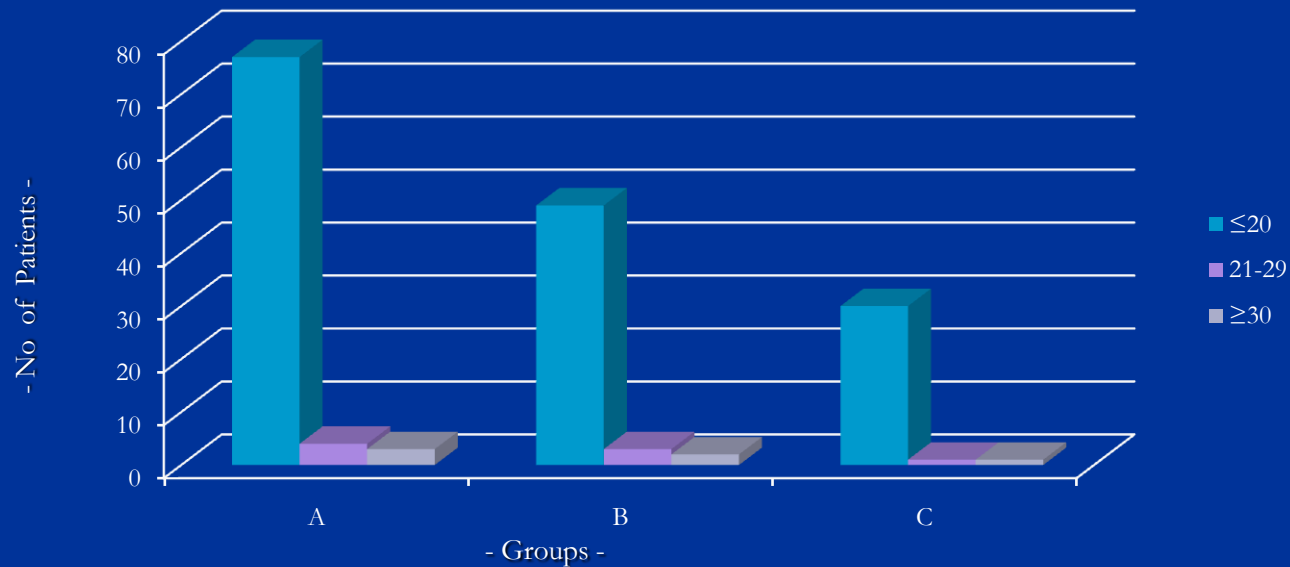
No of patients having co infection

# *Observations & Result continued..*

Group	CD4 Counts	HIV associated immunodeficiency	Number(%) of patients	Mean $\pm$ SD CD4 Counts	Vitamin D (ng/ml)
A	<200/mm <sup>3</sup>	Severe	81 (47.65%)	109.78 $\pm$ 51.40	10.43 $\pm$ 4.98
B	200-349/mm <sup>3</sup>	Advanced	53 (31.18%)	269.98 $\pm$ 45.24	11.89 $\pm$ 6.01
C	$\geq$ 350/mm <sup>3</sup>	Mild or None	36 (21.2%)	532.78 $\pm$ 175.90	12.21 $\pm$ 5.64
Total	Total		170 (100%)	249.30 $\pm$ 186.74	11.26 $\pm$ 5.49

Vitamin D levels in different groups according to level of immunodeficiency

# Observations & Result continued..



Distribution of patients according to vitamin D levels in groups

Groups	≤ 20 ng/ml	21-29 ng/ml	≥ 30 ng/ml
A	77 (95%)	4 (5%)	0 (0%)
B	49 (92.4%)	3 (5.6%)	1 (1.8%)
C	33 (91.6%)	2 (5.5%)	1 (2.7%)
Total	159 (93.5%)	9 (5.2%)	2 (1.1%)

Number of patients according to Vitamin D levels in groups

# *Vitamin D deficiency*

## *Observations & Result continued..*

- Vitamin D deficiency = 93.5%
- Vitamin D insufficiency = 5.2%
- Hypovitaminosis = 98.7%

# *Observations & Result continued..*

Groups	CD4 counts in male	Vitamin D levels in males (ng/ml)	CD4 counts in female	Vitamin D levels in females (ng/ml)
A	106.56 $\pm$ 48.87	10.82 $\pm$ 5.19	123.93 $\pm$ 61.17	8.72 $\pm$ 3.55
B	268.03 $\pm$ 48.29	12.31 $\pm$ 5.96	275.43 $\pm$ 36.45	10.72 $\pm$ 6.25
C	521.38 $\pm$ 186.44	11.83 $\pm$ 4.94	580.00 $\pm$ 122.68	13.79 $\pm$ 8.25

Vitamin D in male and female in groups



# *Observations & Result continued..*

Diet	Non vegetarians	Vegetarians	P Value
CD4 counts (mm <sup>3</sup> )	246.64 ± 19.59	223.13 ± 17.21	0.405
Vitamin D (ng/dl)	11.34 ± 5.52	9.65 ± 4.66	0.397
Calcium (mg/dl)	8.75 ± 0.78	8.37.00 ± 0.82	0.183
Total	11.26 ± 5.49	249.30 ± 186.74	

Characteristics of patients according to diet

# *Observations & Result continued..*

Characteristic	On ART	ART Naïve	P Value
CD4 counts (mm <sup>3</sup> )	274.28 ± 20.3	175.51 ± 23.27	<b>0.002</b>
Vitamin D levels (ng/ml)	11.54 ± 5.97	10.45 ± 3.63	0.263
LDL(mg/dl)	97.74 ± 30.70	71.39 ± 29.53	<b>&lt;0.01</b>
Total Cholesterol(mg/dl)	159.16 ± 52.20	117.04 ± 42.36	<b>&lt;0.01</b>

Characteristics of patients on ART and ART naïve

# *Discussion/Limitations of our study*

- High prevalence of hypovitaminosis-D in Indian HIV patients  
(95% Vs 70%)
- Correlation of low vitamin D levels with CD4/ART
- Consequences of low vitamin D levels in HIV/AIDS patients
- Inference and advice

**Thank You**