

High burden of childhood rickets in Bangladesh: The first national prevalence survey of mineral deficiency

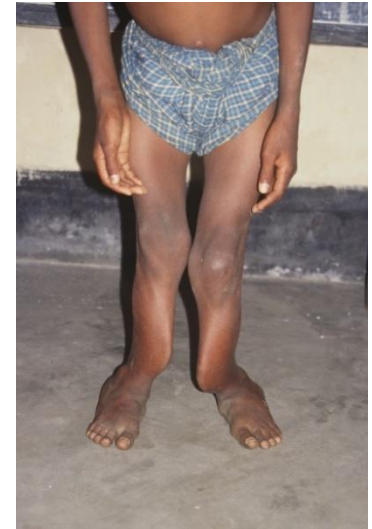
¹ SKRoy, ¹R.Rakib, ¹N.Alam, ²S.Haque, ²H.K.Das, ²M.Ali, ²T.H.Talukder,
²S.M.M.Rahaman ² MAR.Chowdhury, ²Selina Amin, ¹M.Iqbal, ¹ A.Bhuiya
¹ M.Khanam, ¹A.Begum,

¹ ICDDR,B, Bangladesh

²Rickets Interest Group(RIG), Bangladesh (UNICEF, NNP, CARE, BRAC,
SARPV, Plan BD)

What is Rickets ?

- Changes in bones due to metabolic disorder of vitamin-D or calcium leading to bone deformity



Background

- Rickets was first reported from Europe in the mid-1600s
- Low dietary calcium intake and low access to dairy products, less sunshine lead to development of vitamin D deficiency and rickets
- Earlier, in Bangladesh, a non-random survey in NSP area of HKI in 28 Upazila in six divisions showed a prevalence of 0.12% lower limb rickets and 0.26% other lower leg deformities in <5 yr children in 2004
- Till now there is no national survey to estimate the prevalence of rickets, so this work was undertaken

Objectives

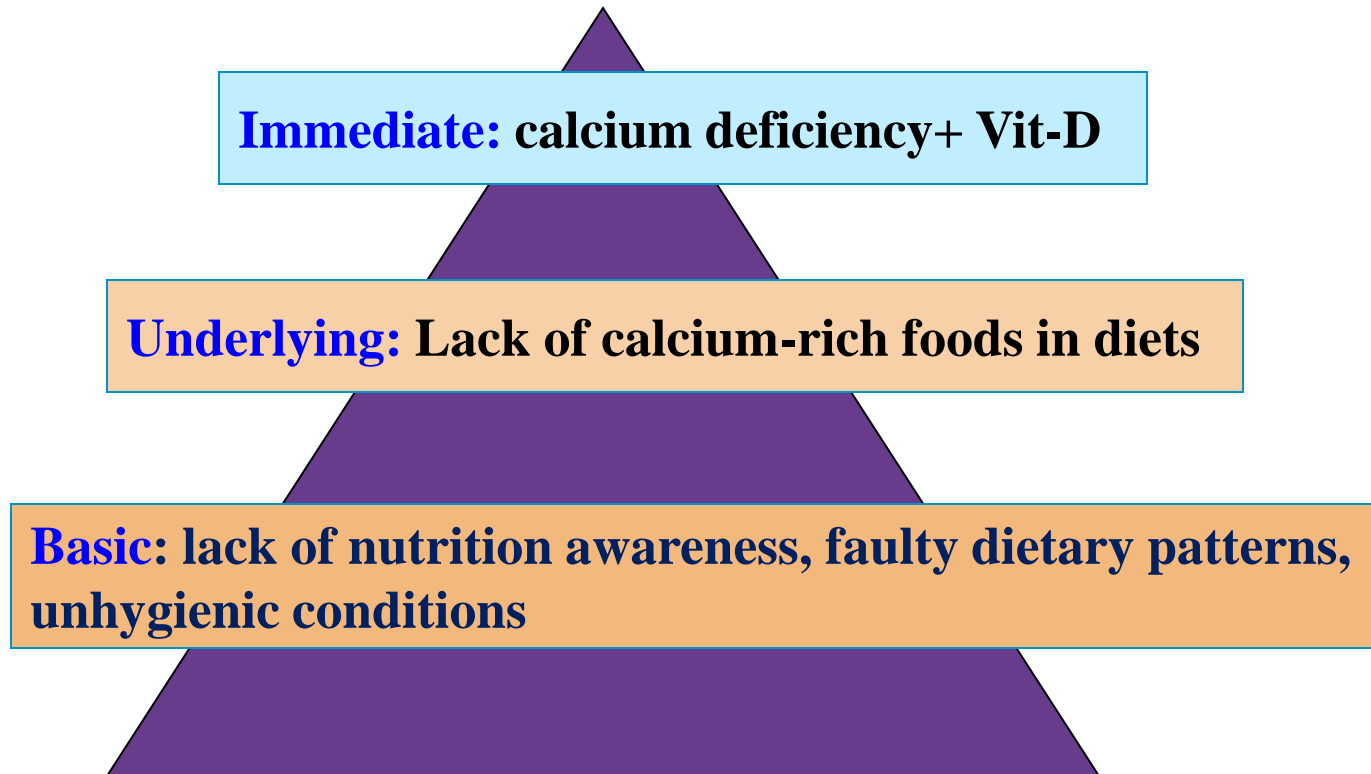
General Objective:

To determine the overall prevalence of rickets among 1-15 year old children in Bangladesh

Specific Objective:

- 1. Prevalence of rickets and its geographical distribution and clinical manifestations among children aged 1-15 years**
- 2. Food frequency on dietary intake of rachitic children**
- 3. Determinants of serum calcium and vitamin D**
- 4. Bony changes with clinical signs**
- 5. Nutritional status of the rachitic children**

Conceptual Framework of Manifestation of Rickets in Bangladesh



Materials & Method

Subjects : 1 to 15 years children

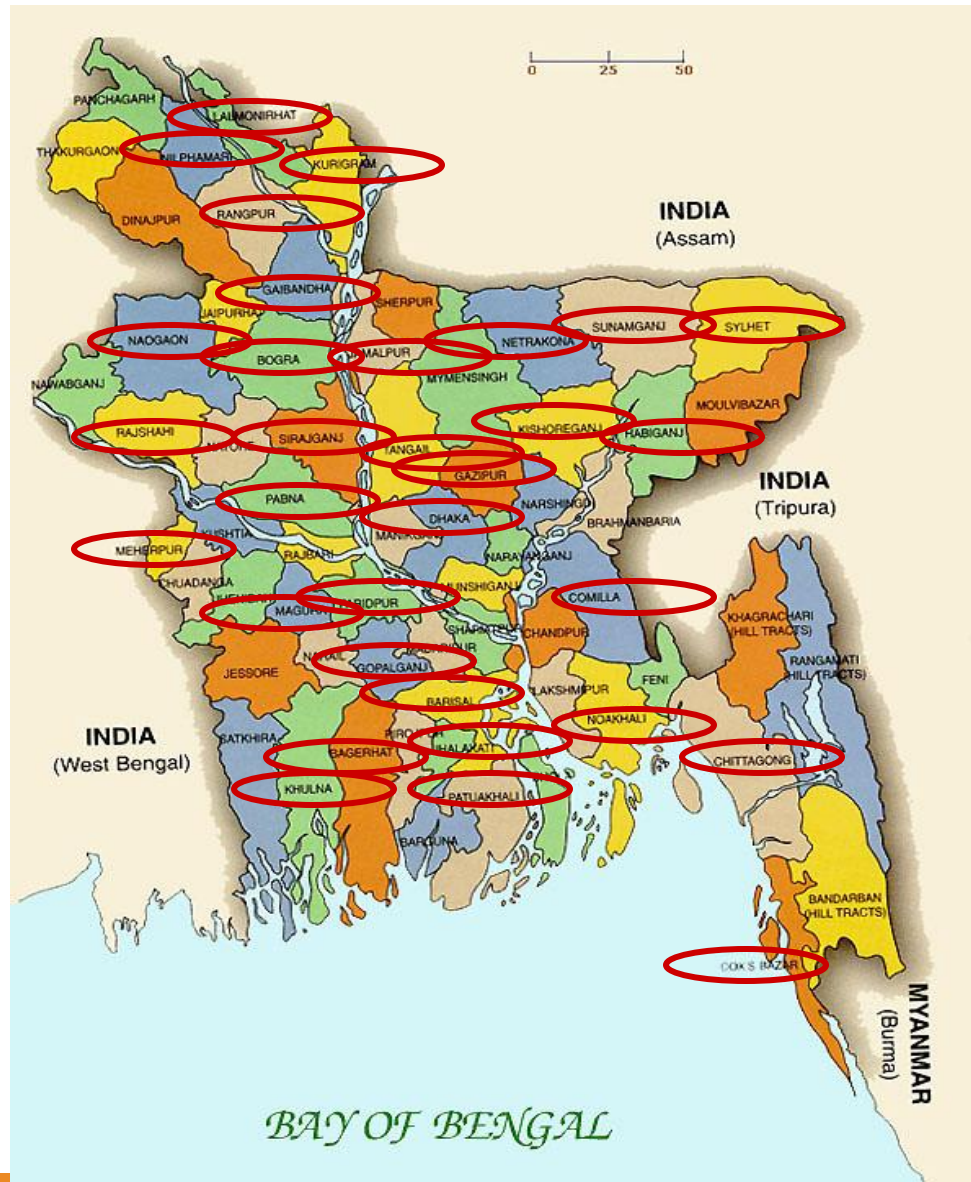
Study area: Rural & Urban areas in six divisions of Bangladesh

Sample Size: 16000 in Rural & 4000 in Urban Areas. Total sample size 20,000.

Duration: 10 months

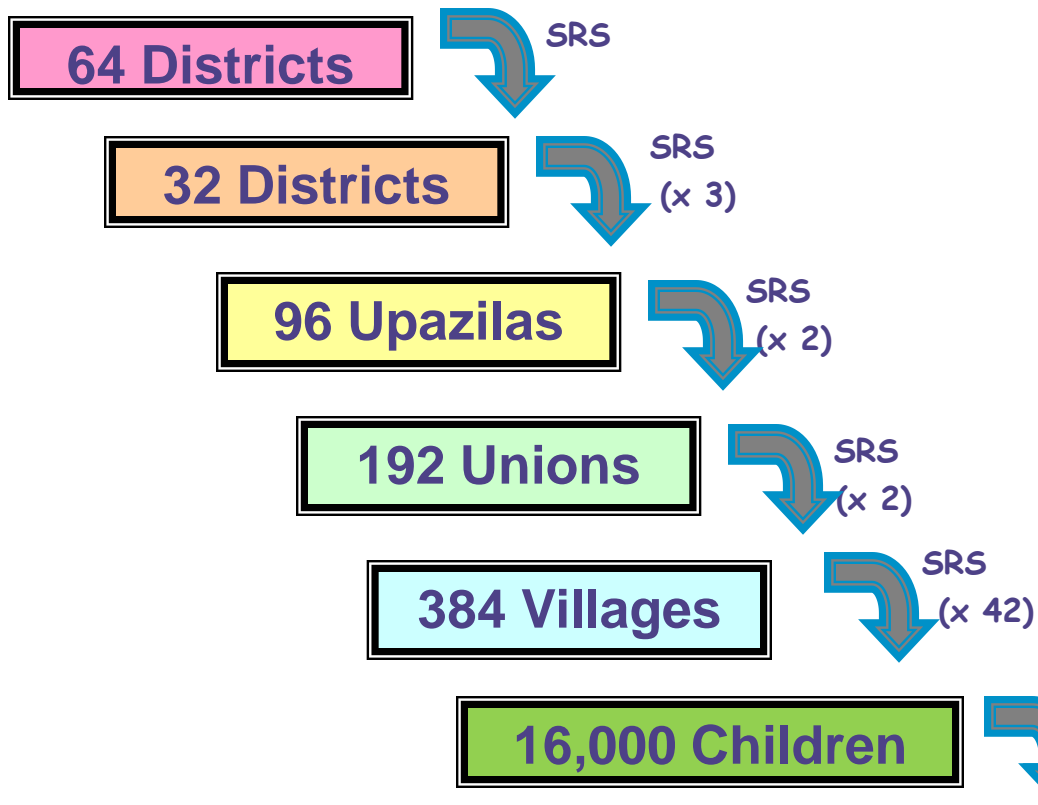
Randomly selected half of the districts and the stratified randomized selection up to village level

Area covered by the survey 2008

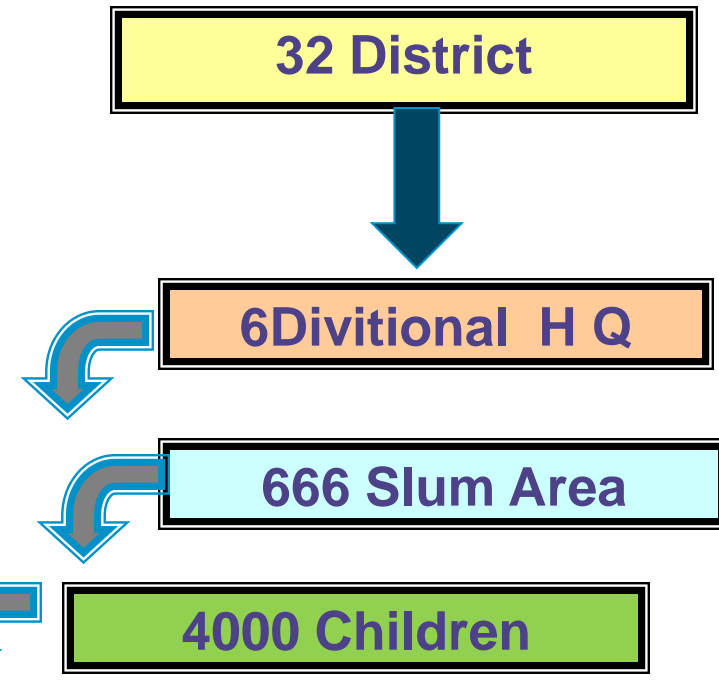


Randomization of areas

Rural



Urban



20,000 Children

**Schematic Diagram of
National Rickets Survey**

Quantitative data collection

1. Anthropometric data

- i. Weight
- ii. Height
- iii. MUAC

2. Dietary assessment

Food Frequency Questionnaire: 24 hr recall, 7 days recall.

3 . Radiological analysis (X-Ray):

- a)Metaphysical enlargement
- b)Frayed metaphases with hazy edges
- c)Metaphysial “cupping”

4. X-rays were taken for Wrist

- a) Wrist Joints and b)Knee Joints

5. Procedure and Diagnosis Pitcher.

Clinical Diagnosis of Rickets

For 1-5 Years Children:

- (i) Age less than 5
- (ii) Height: <-2.0 SD
- (iii) Wrist Joint Swelling
- (v) Leg pain during walking
- (vi) Slight Bowing of whole leg
- (vii) Slight bowing between knee & ankle joint.

Presence of any 3 of them indicates rickets.

For 6-15 Years Children:

- (i) Wrist Joint Swelling
- (ii) Costal Rosary
- (iii) Leg Pain During Walking
- (iv) Bow Leg
- (v) Knock Knee
- (vi) Wind Swept
- (vii) Sabre Tibia.

Presence of any of the visible symptoms indicates rickets.

Identification of rickets in children 1-5 yr old

By demonstrating a multi colour poster containing The features of costal, lower & upper limb

There are 7 beginning Signs (given below) of rickets; any 3 of them indicate rickets.

1.

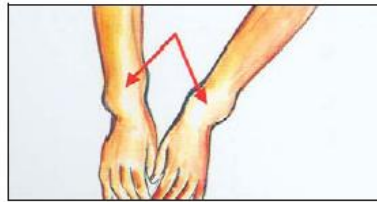
Age < 5

2.

HAZ < -2DS

3.

Wrist enlargement



4.

Little leg deformity

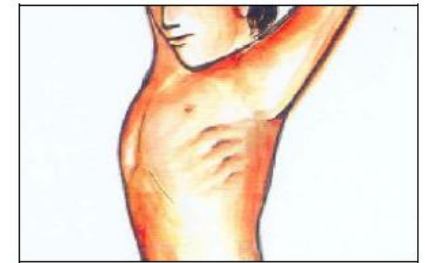


5.

Leg pain

6.

Costal beading



7.

Beginning tibia cross



Rachitic features in children 1-15 yr old

Knock Knee



Bow Leg



Windswept



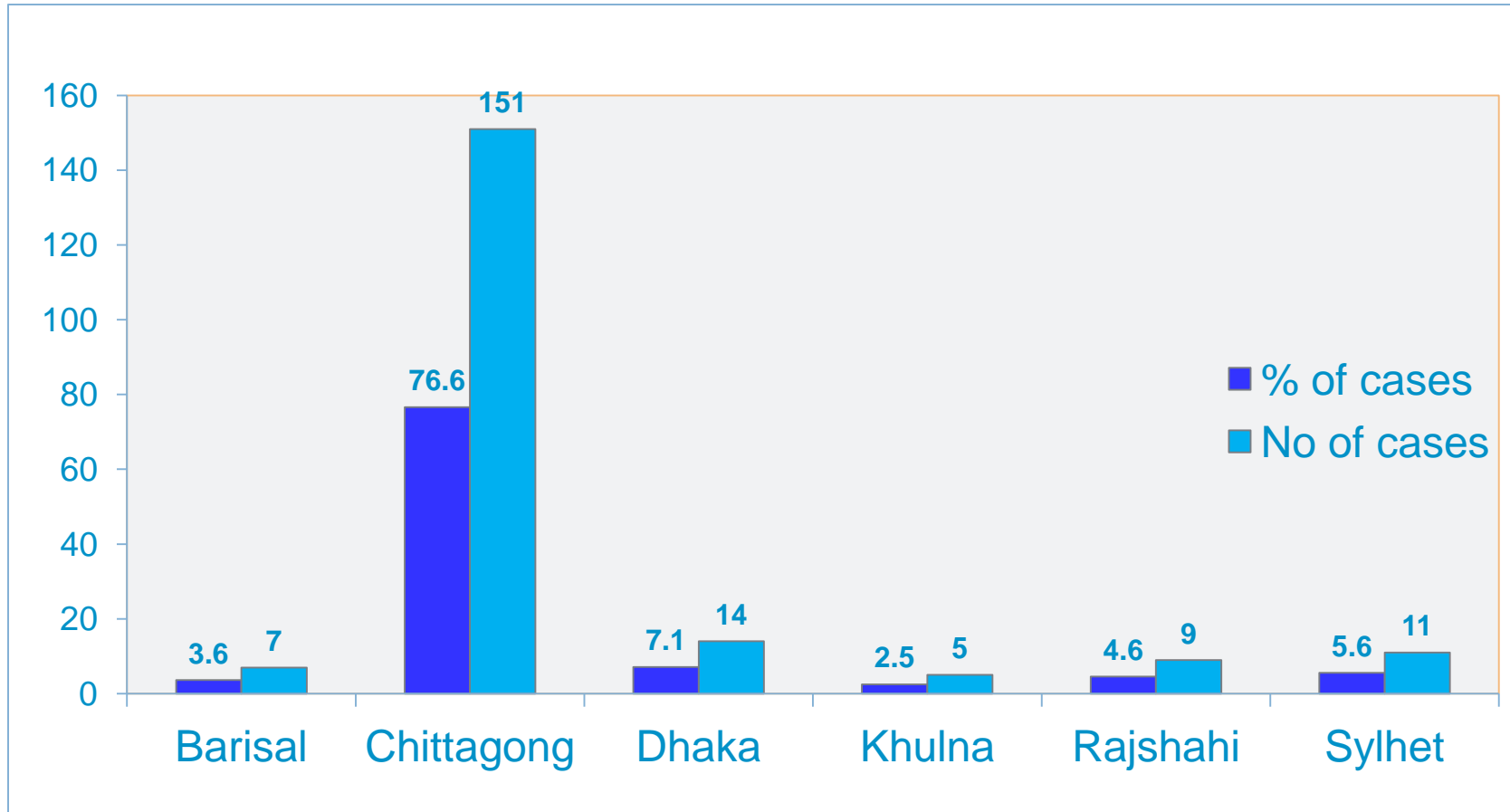
Sabre Tibia



Results of the study

Indicator	No of rachitic children
Total children population screened	20,000
Total rachitic children	197
Prevalence of Rickets	0.99%
Qualitative Data collection through In-depth interview	24
X-ray taken in cases	156
Blood sample taken for bio-chemical test	156

Percentage distribution of Rickets cases by division



Distribution of Rachitic boys and girls by number of clinical signs

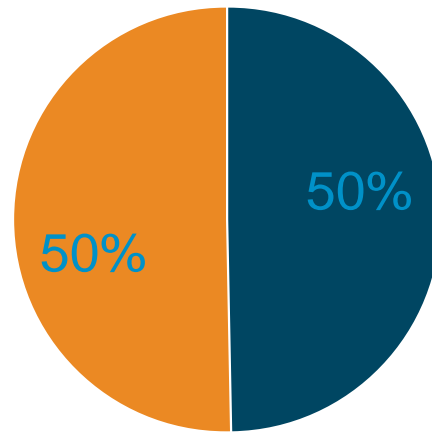
Table-05: Distribution of Rachitic boys and girls by nu

Present of sign	Boys		Girls	
	(n)	(%)	(n)	(%)
Below 3 sings	7	5.8	8	10.4
3 signs	48	40.0	25	32.5
4 signs	44	36.7	32	41.5
5 signs	15	12.5	7	9.1
6 signs	6	5.0	5	6.5

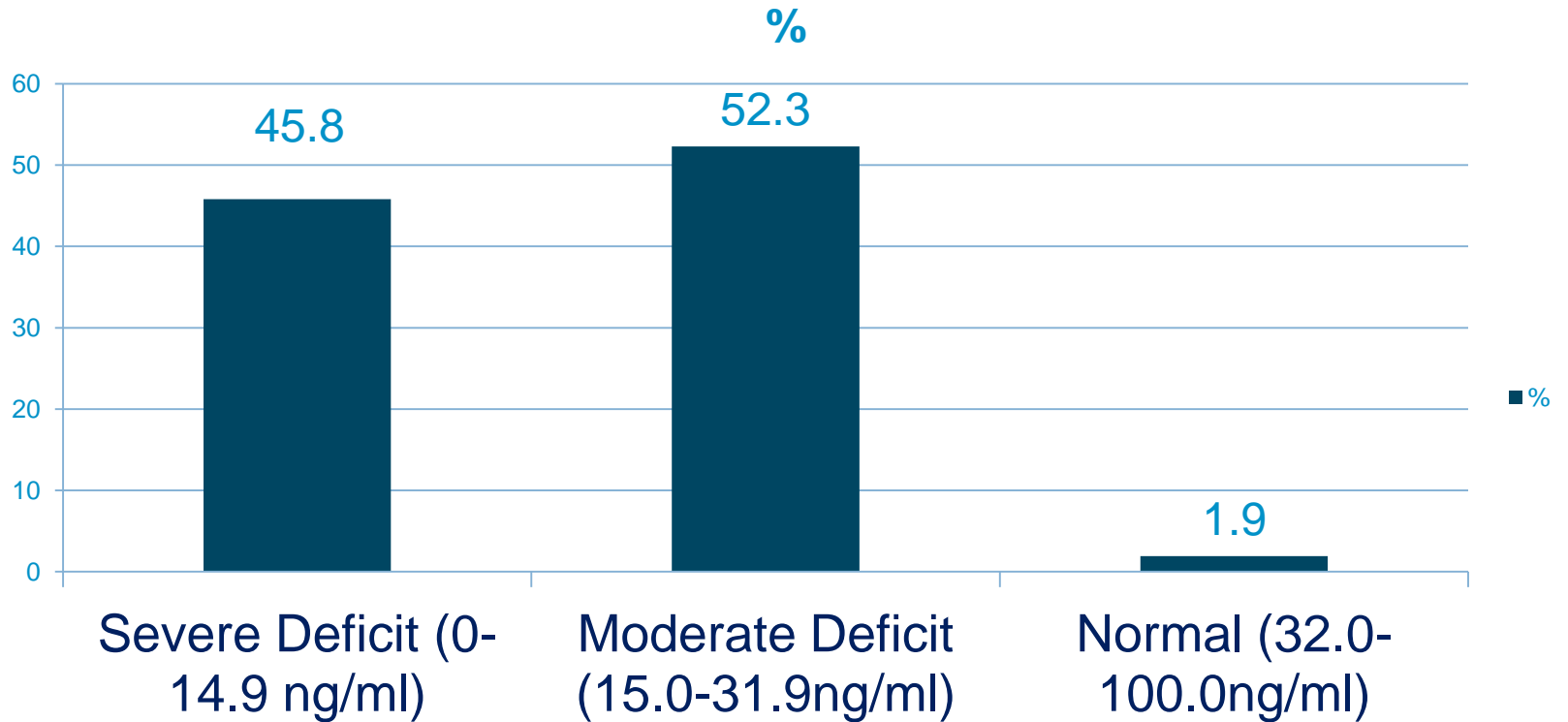
Percentage distribution of Ca level of Rachitic Children

%

- Deficit level (<2.19mmol/L)
- Normal(>2.19 mmol/L)



Serum vitamin- D level of rachitic children



Nutritional status of rachitic children

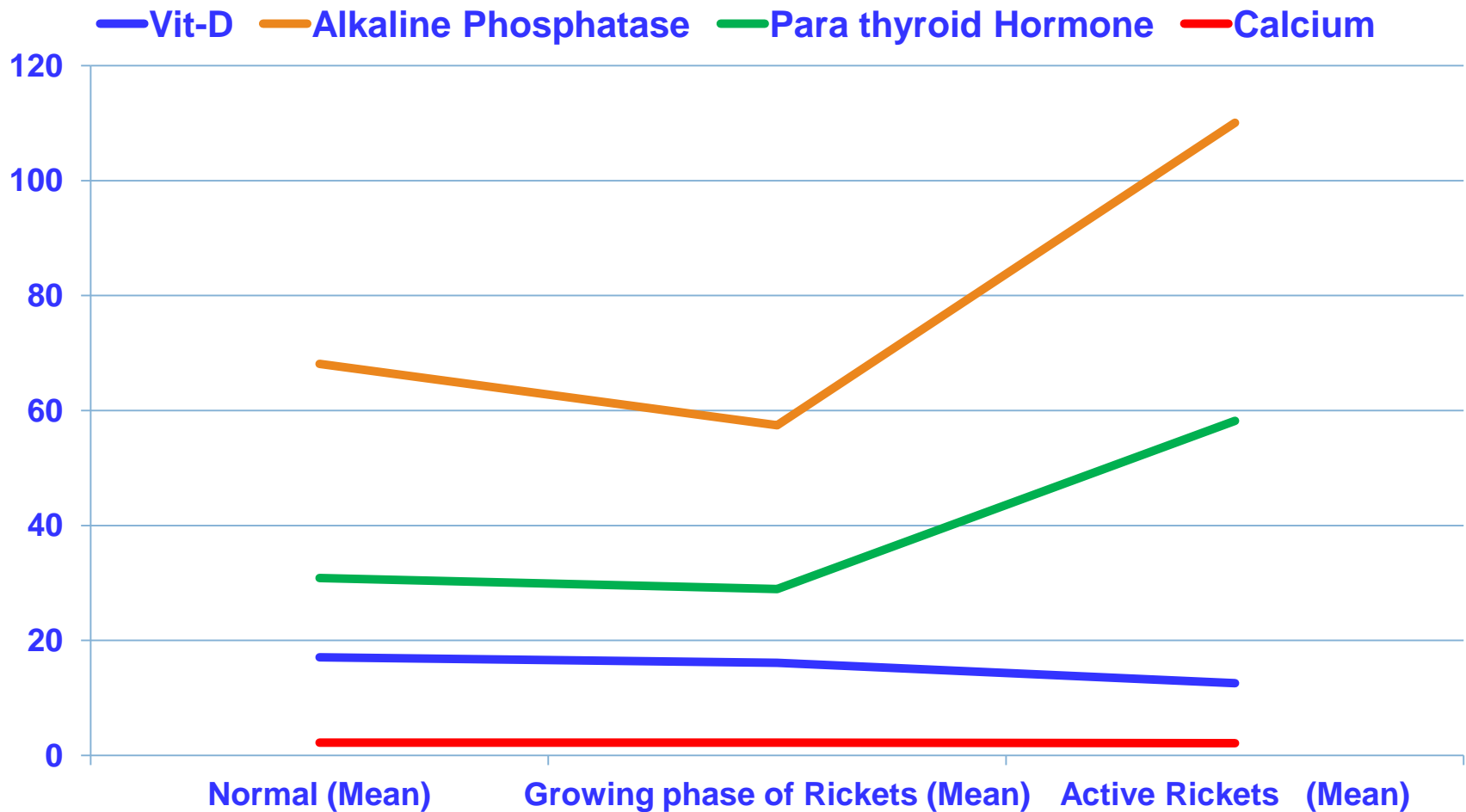
Indicator	Rachitic Children	
	Number	Percent
LAZ/HAZ		
<-3SD	82	53.3
-3SD to -2.01SD	33	21.4
-2SD to above	39	25.3
Total (N)	154	100.0
WAZ		
<-3SD	61	40.1
-3SD to -2.01SD	45	29.6
-2SD to above	46	30.3
Total (N)	152	100.0
WLZ/WHZ		
<-3SD	2	1.4
-3SD to -2.01SD	21	15.1
-2SD to above	116	83.5
Total (N)	139	100.0

Serum Level of ($\bar{x} \pm SD$) Vit, Pth, Alk ph and Ca of Different phases of Rachitic children

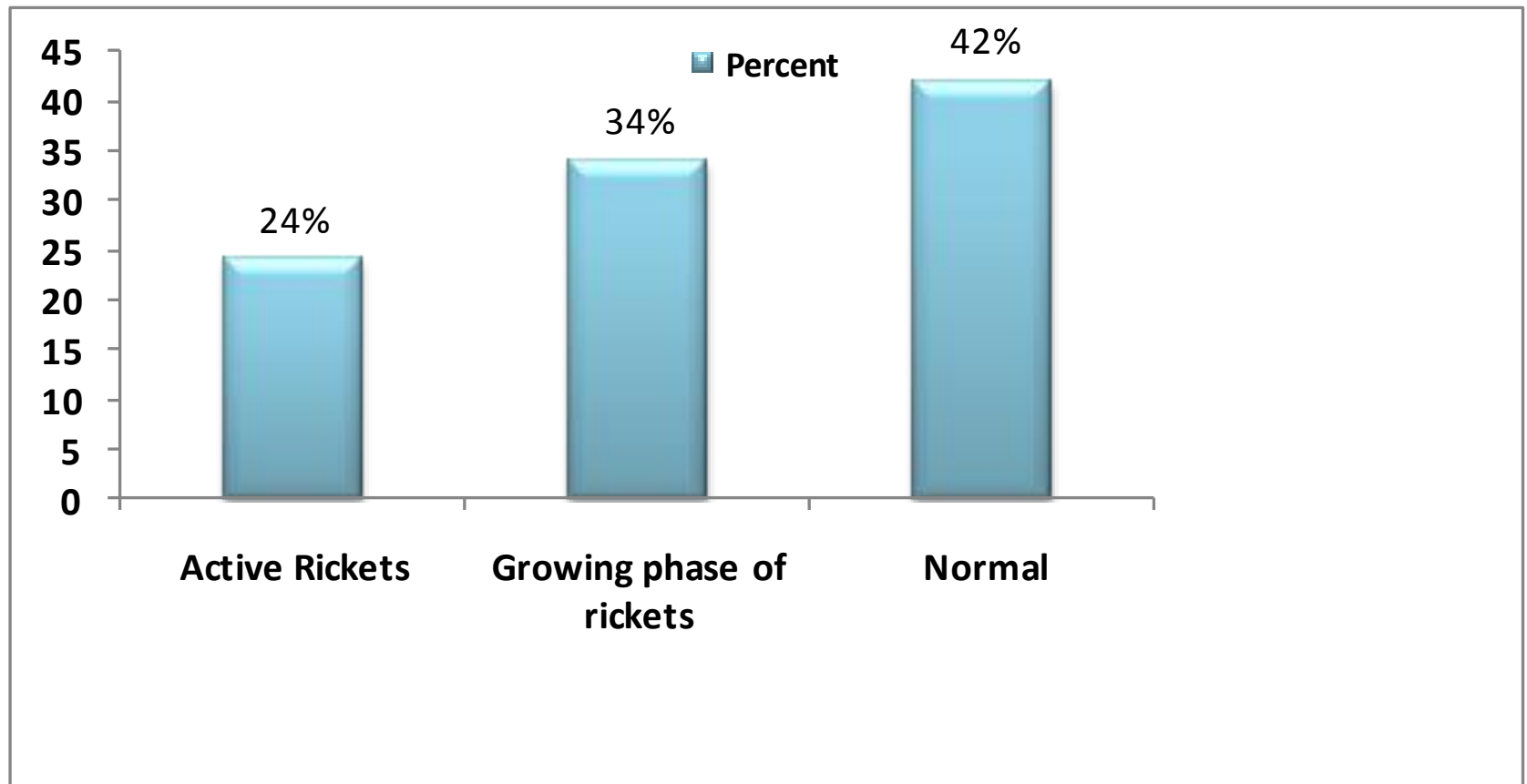
Rachitic Children	Vit D*	PTH**	Alk ph***	Cal****
Active Phase	12.5±5	58±43	68±32	8.6±0.6
Growing Phase	16±6	29±31	57±20	9±0.5
Normal	17±7	30±32	110±56	9±0.6

$P^* = 0.003, P^{**} = 0.001, p^{***} = 0.001, P^{****} = 0.002$

Mean of the biochemical levels with radiological signs



Radiological findings according to categories



Burden of Rickets in Bangladesh

- Prevalence of rickets = 0.99% (National Rickets Survey 2008)
- Population in age 1-15 years children = 34.2% (HDSS 2004)
- Total population in Bangladesh = 160,000,000 (UNFPA 2008)
- Total estimated affected rachitic children
 - = $0.99\% \times 34.2\% \times 160,000,000$
 - = 5,41,728
 - = Nearly 5.5 lacs

Conclusion:

1. The result shows that rickets is an emerging public health problem (0.99%) in Bangladesh.
2. High level of malnutrition in Rachitic children : severe stunting, under-weight and wasting were 53%, 40% and 1.4% (<-3 SD).
3. According to food frequency in last 24 hours, 28% children took leafy vegetables, 13% took small fishes, 12% took egg for one time.
4. About 49% rachitic children were deficient in calcium.
5. About 98% rachitic children's serum vitamin D in deficit level

Recommendation

- 1. Government policy should be developed to prevent rickets in children and ensure treatment**
- 2. A case control study for risk factors or etiology should be under taken soon.**
- 3. Nutrition education on dietary measures for prevention and treatment follow up be undertaken in geographically high risk areas.**
- 4. Provide education to families regarding the importance of appropriate breastfeeding and complementary feeding.**