Vitamin A-deficiency, fish eating status and the consumption of other pro-vitamin A-carotenoids among the women of the fishing community of North East India: An analysis of the gender bias in the family nutrition management.

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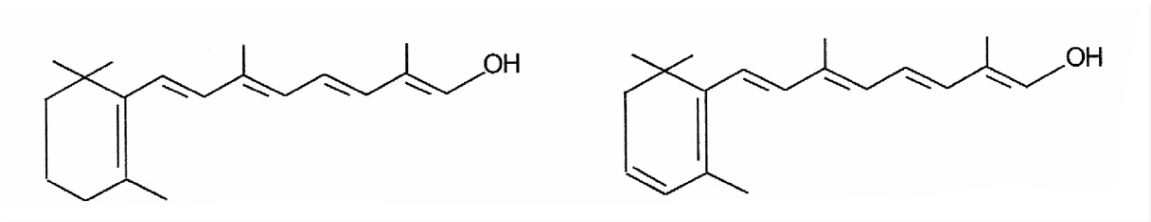
Vitamin A



Retinol

[Vitamin A1]

Marine Fishes
Adult Amphibia
Reptiles
Aves *1
Mammals

Dehydroretinol

[Vitamin A2]

Freshwater Fishes*2
Larval Amphibians

Note :

***1 It has been found that in the liver oil of freshwater fish eating birds such as the Kingfisher, there is deposition of dehydroretinol for certain period**

***2 Including some migratory fish, migrating from saltwater to freshwater, *viz.* Salmonids. Hilsa.**

Fish is an excellent source of Vitamin-A

Green vegetables supply a significant amount of Pro-vitamin-A

Carotenoids such as Beta carotene, Lutein, Cryptoxanthin etc.

AN ADEQUENT AMOUNT OF VITAIMN-A SUPPLY COULD RESTORE NORMAL PHYSIOLOGICAL FUNCTIONS OF VITAMIN-A.

Aims of the present investigation (i)

- Identification of the amount of fish retained from their catch or fishing efforts and consumption of the same per head per week.
- Identification of the species of fishes taken /consumption amount and expected vitamin A turnover from the amount
- Estimation of the amount of provitamin A from the cooked vegetables taken by the community from their vegetable recipe.

Aims of the present investigation (ii)

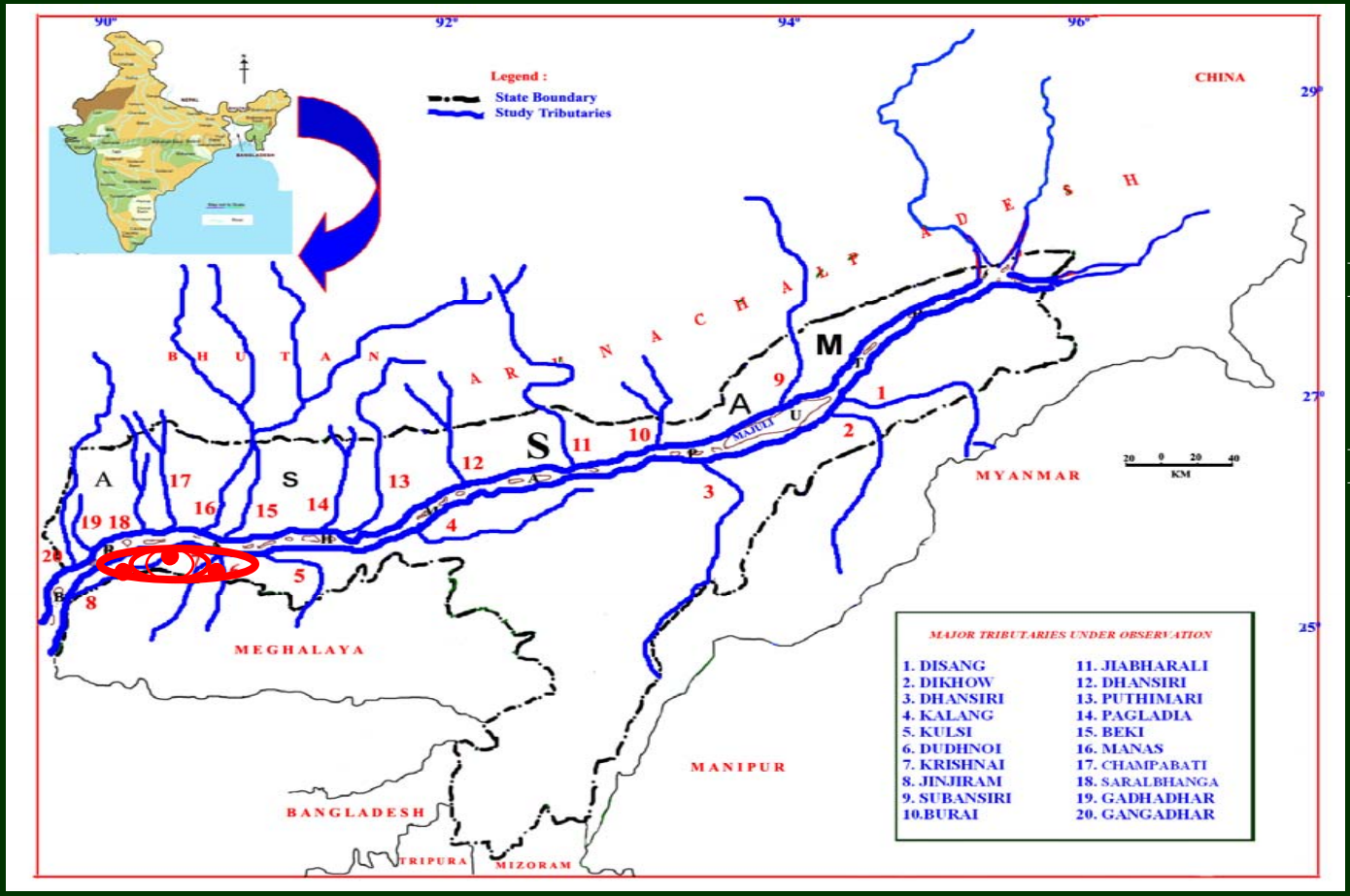
* Estimation of plasma vitamin A i.e retinol concentration by HPLC and establishment of any co-relation from the amount of fish and vegetables taken and overall plasma vitamin A concentration found in males, females, children and pregnant women and drawing a conclusion on the gender bias community nutritional management.

*An attempt to supplement vitamin A is planned, where 100g boil Amblypharyngodon mola would be administered to certain number of vitamin A-deficient individuals including children.

*Further a thorough survey on the literacy %, income status, size of the family and plasma vitamin A has been designed to support any gender bias in the community of fisherfolk.

Samples :

The fishing community residing in the lower stretches of the Brahmaputra valley as well as from the adjacent areas of western Meghalaya.



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* The economic conditions,
* Literacy survey
* Involvement in fishing,
* Amount of fish retained for their consumption etc. were taken from a thorough house to house survey for the last three years.

Collection of Blood Samples :

Blood samples were collected through the –

***supervision of the Primary Health Centres/**
***Involvement of Several volunteers to the Health Centers and to the laboratory.**

Plasma separation : The blood samples were collected and immediately kept in low temperature (in ice-containers). The plasma was separated through centrifuge (5 min in 5000 rpm).

HPLC Procedure :

1. **Column : Reverse phase column, 300mm x 3.9 mm-C-18, 4µMm column (4.6 X 250 m Water). Liquid chromatograph (Varian Model, 5000), Integrator (Varian, 4270).**
2. **Elution : Retinol, dehydroretinol beta-carotene and the internal standards were isocratically eluted with the mobile phase consisting of mobile phase : acetonitrile/dichloromethane/methanol/water/proponic acid (71:22:4:2:1, v/v/v/v/v) as mobile phase the flow rate was 1.0 ml/ min. mobile phase consisting of 10% THF, 90% methanol (v/v) and 0.5 g BHT**
3. **The internal standards i.e . retinyl palmitate and beta-apo-8-carotenoic acid ethyl ester (CAEE) were used in order to examine the extraction efficiency of retinol, dehydroretinol and provitamin A carotenoids, i.e beta-carotene from the plasma, fish and cooked vegetables. It has been found that an average 97-98 % efficiency of the extraction of the internal standards has been ascertained.**

* **Flow rate of 1.5 ml/min. (Guillou *et al.*, 1993) .**

* **The different retinoids were obtained as a generous gift from Hoffman La-Roche, Switzerland**

* **Similarly the vitamin A (retinol , dehydroretinol and carotenoids content) from the freshly collected fish samples :**

* **The fish usually catch and consumed by the community were also measured by HPLC as described. (Guillou *et al.*, 1993)**

Estimation of Carotenoids from Cooked Vegetables :

- **The cooked vegetables (100 g) were also extracted by Folch reagent (Folch *et al.*, 1957) BHT (5.0 Mg/ lit) was added in the Folch reagent (Folch *et al.*, 1957).**

- **Estimated from the Lipid Extracts through visible absorption at 450 nm with absorption co-efficient, $E^{1\%}_{1cm}$ 2550.**

*** The HPLC was conducted as followed earlier.All calibration and procedure of elution, injection etc. are followed after Guillou *et al.*, 1993.**

Identification of Fish :

Talwar and Jhingran (1991), Jayaram (1999) Nelson (1994) and www. fishbase. org

The provitamin A- containing vegetables were identified (CSIR,2000; Dutta, 2000; Mitra 2000).

Lipid Isolation :

Followed after Folch *et al.*, 1957.

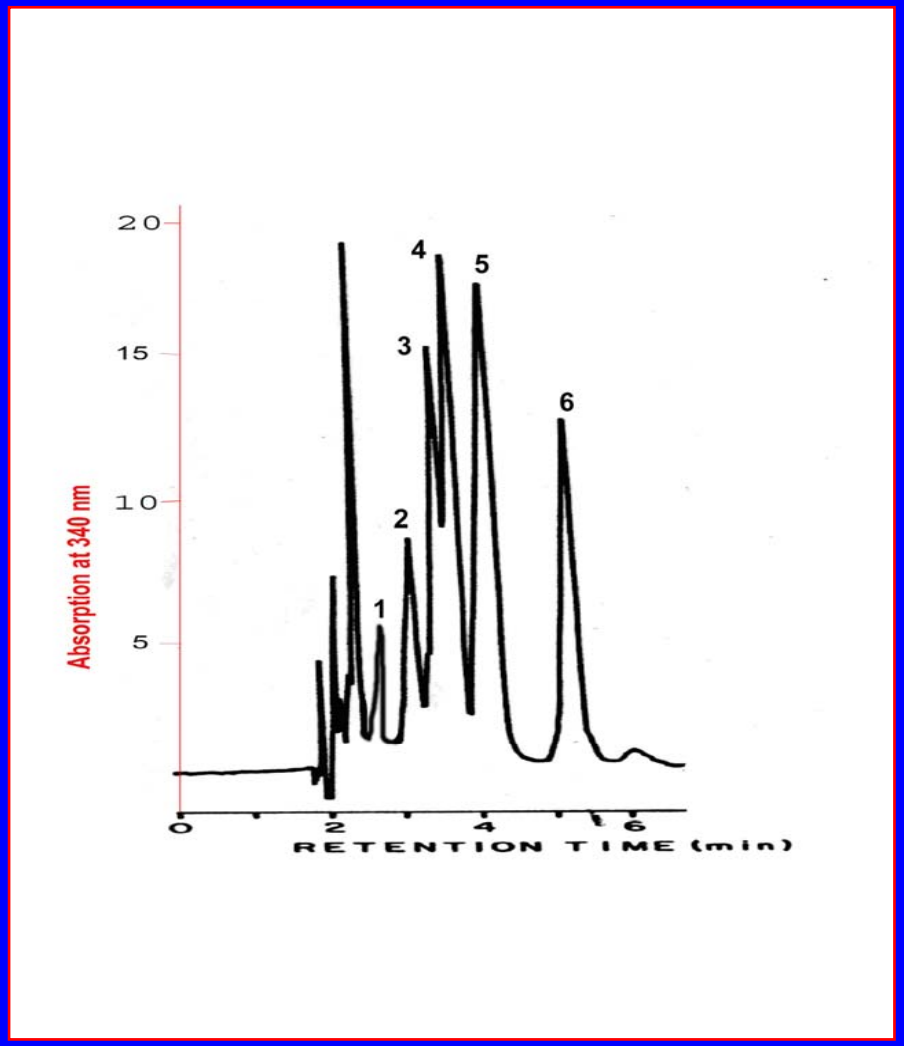


Fig-1 : HPLC Chromatogram of retinoids1. Retinoic acid, 2. Dehydroretinol, 3. Dehydroretinal 4. Retinol, 5. Retinal, 6. Retinyl propianate

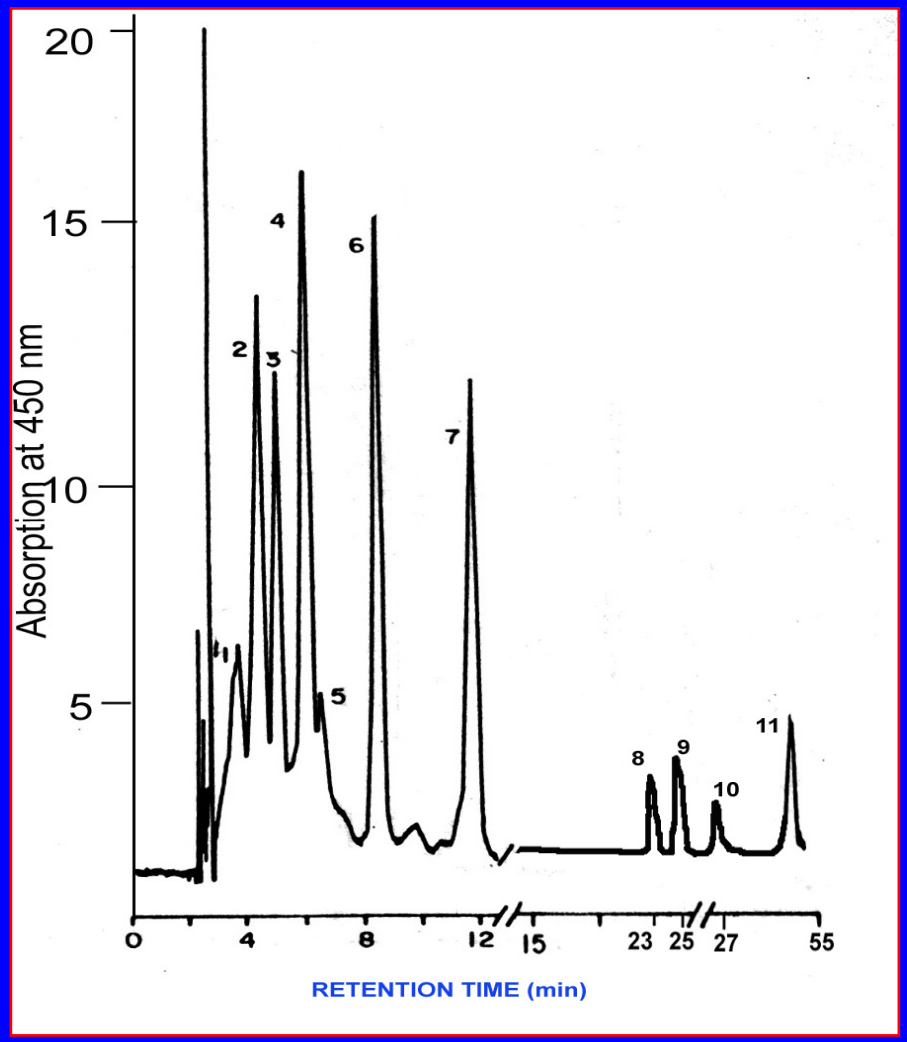


Fig-2 : HPLC Chromatogram of carotenoids 1. Crustaxanthin, 2. Astaxanthin 3. Iso-zeaxanthin 4. Phoenicoxanthin 5. Zeaxanthin, 6. Canthaxanthin, 7. CAEE, 8. 8-Apo Carotenal, 9. 12-Apo Carotenal, 10. 14-Apo Carotenal, 11. Beta-carotene

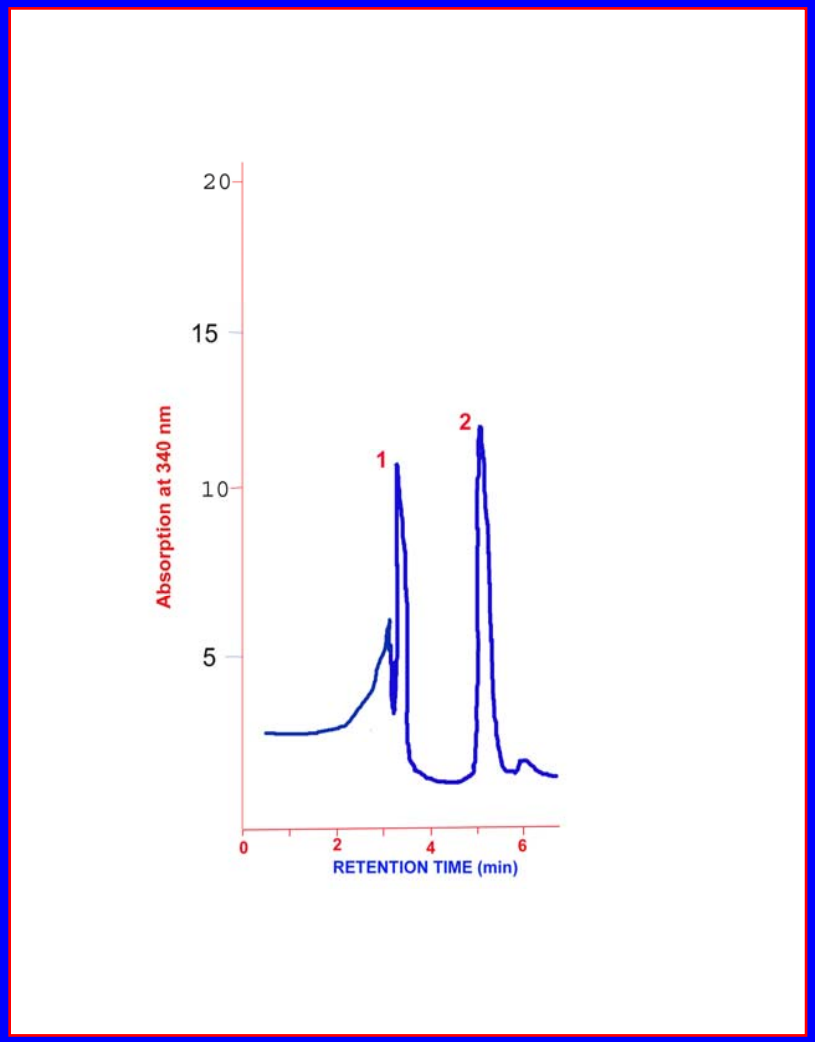


Fig-3 : HPLC Chromatogram of retinoids : Isolated from the plasma.

1. Retinol, 2. Retinyl propianate (Internal standard)

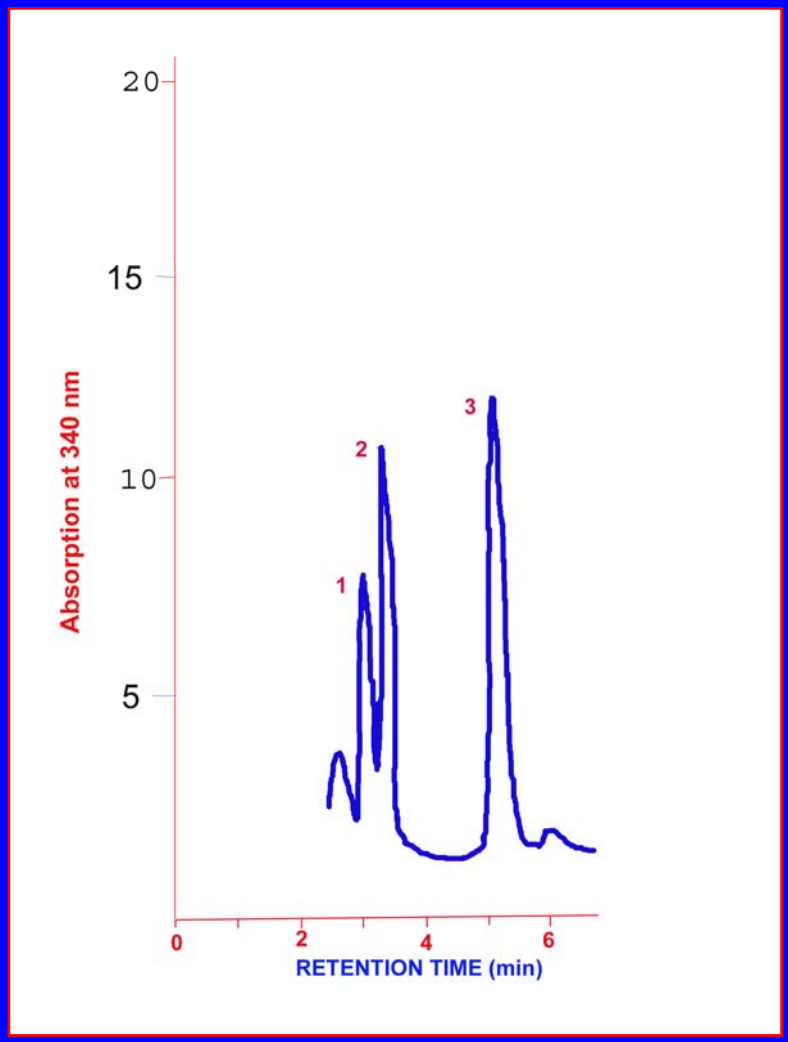


Fig-4 : HPLC Chromatogram of retinoids : Isolated from the fish.

1. Dehydroretinol, 2. Retinol,

3. Retinyl propianate (Internal standard)

The HPLC – UV absorption maxima & retention time of vitamin A (Retinol & Dehydroretinol) carotenoids (Beta-carotene)etc. are shown below.

Retinoids	Uv-visible absorption maxima	Retention time (minutes)
Retinol	325 nm	3.85
Dehydroretinol	350 nm	3.33
Retinyl palmitate	326 nm	59.54
CAEE	445 nm	11.65
Carotenoids (Beta-carotene)	450 nm	49.8

Fishing efforts, No. of families, literacy rate, income and amount of fish retained from their fishing efforts and consumption per day by individual members

No. of fishing Efforts	No. of families	% of literacy	Income * /family (in Rs.)	No. of persons	Amount (g)** of fish retained/consumed / head/day
1	50	70 40 50	3500/11 3000/6 2000/33	4 6 5	400 / 57 / 14.25 500 / 71.4 / 12 300 / 43 / 9
2	80	70 50 45	4000/8 2500/40 2000/22	8 7 6	1000 / 143 / 18 700 / 100 /14.2 600 / 85 / 14.1
Daily	10	70	3500/10	5-6	850 / 121.4 / 24.2

** Fish retained- amount kept for the week; Consumed-consumed by all the members of the family per day from its retention; Head per day- consumption of fish by an individual member per day from its retention.

The value are the mean (+ SD) of the individuals and are significantly different ($p>0.05$)

Species of fish consumed and their vitamin A, retinol (vitamin A1), dehydroretinol (vitamin A2) and provitamin A (µg /100 g) concentratrion

Species	Retinol (Vitamin A_1)	Dehydroretinol (Vitamin A_2)	Provitamin A
Amblypharyngodon mola *Rasbora daniconius* *Ambasis nama* *Ambasis ranga* *Channa gachua* *Chela laubuca* *Esomus danricus* *Anabas testudineus*	> 1400	> 450	> 3500
Channa punmctatus *Puntius sophore* *Puntius ticto* *Monopterus cuchia* *Glossogobius guiris* *Mastacembelus armatus* *M,astocembelus pancalous* *Polyacanthus fasciatus* *Colisa lalia* *Colisa sota* *Labeo boga* *Cirhinus reba* *Danio davario* *Salmopharia bacaila*	>1000	>700	> 2500
Clarias batrachus *Mystus vittatus* *Mystus tengra* *Heteropneustes* fossilis *Loches*	>200	>1000	> 1800

Fish species listed in descending order of Vitamin A content category.

Amount of fish (g), expected vitamin A turnover from the amount of fish consumed (µg) *and provitamin A (µg) consumption per day by different groups / sexes / and pregnant women.

Sex	Age group/ No. Persons	Amount of fish(g) consumption/Expected vitamin A turnover from the amount of fish consumed (µg) *	Amount of Provitamin A consumption(µg)
Male	i) 4 -10/60	24 /250	1150 ± 75[a]
	ii) 10-20/50	18 /200	1110 ± 40[a]
	iii) 20-40/30	14 /175	1200 ± 85[a]
	iv) 40-60/40	12 /120	1050 ± 65[a]
Female	i) 4-10/40	24 /250	1000 ± 150[a]
	ii)15-20/60	14 /120	950 ± 120[b]
	iii)20-40/70	12 /120	800 ± 75[b]
	iv)40-60/120	9 /100	650 ± 110[b]
Pregnant women	i)15-30/5	12 /120	650 ± 115[b]
	ii)30-40/5	12 /120	650 ± 120[b]

* The values are the average (± SD) value of the No. of samples for respective items.

** Amount provitamin A carotenoids are the amount calculated from the 100 g of cooked vegetables collected from each family.

Total vitamin A (retinol, ng/ml) and pro-vitamin A (ng/ml) in the blood plasma of males, females, female during pregnancy and children.

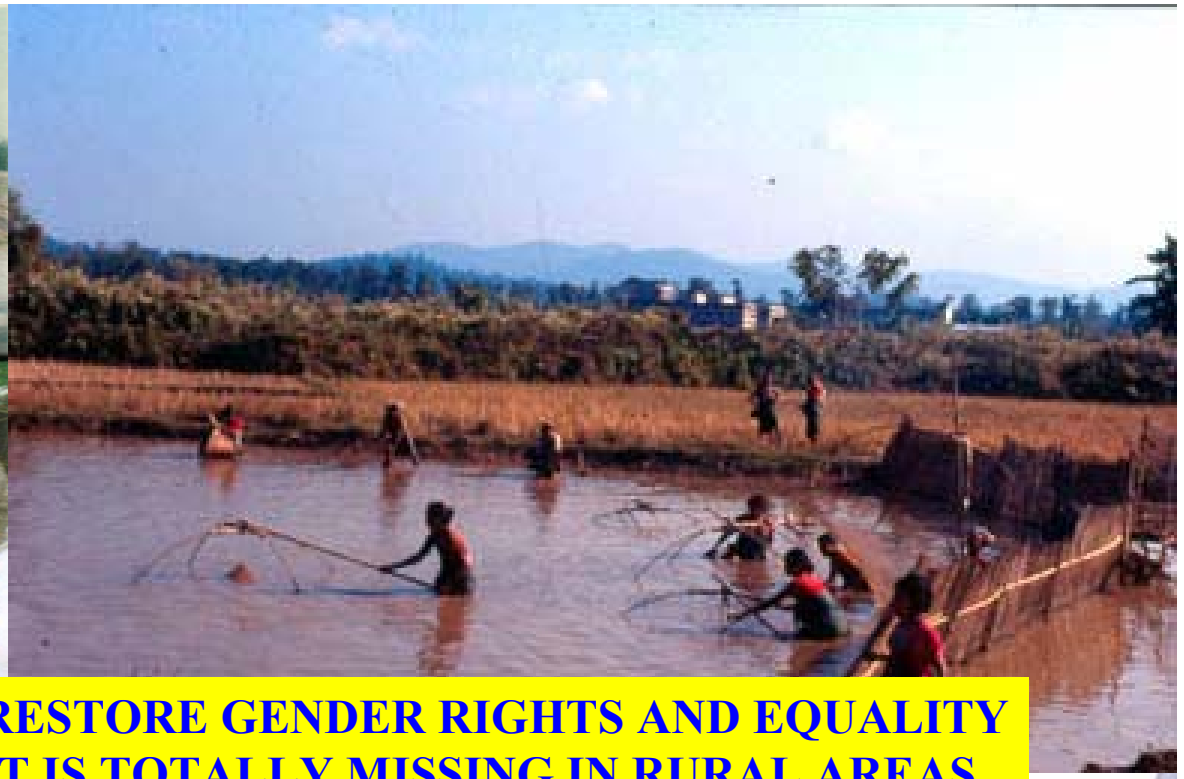
Sex	Age groups /No. of Individuals	Plasma Vitamin A ng/ml	Plasma Carotenoids ng/ml
Male	4-10/ 60	135 ± 10^{a}	55 ± 10.6^{a}
	10-20/ 50	155 ± 7.5^{b}	85 ± 17^{b}
	20-40/ 30	175 ± 10^{c}	76 ± 5^{b}
	40-60/ 40	165 ± 15^{a}	75 ± 8.3^{b}
Female	4-10/ 40	120 ± 5^{d}	60 ± 15^{c}
	15-20/ 60	135 ± 30^{d}	53 ± 10^{c}
	20-40/ 70	130 ± 15^{d}	52 ± 12^{c}
	40-60/ 120	135 ± 9^{d}	55 ± 15^{c}
Pregnant Woman	15-30/ 5	140 ± 10^{d}	55 ± 18^{c}
	30-40/ 5	135 ± 5^{d}	53 ± 15^{c}

The value are the mean (± SD) of the individuals, (ii) and values having different superscript differ significantly in respective rows ($p > 0.05$)

Administration of boil *Amblypharyngodon mola* 100 g/ day to vitamin A-deficient children and women suffering from night blindness.

Subject/No.	Age groups	No. of days of feeding *A. mola*	Approximate amount of Vitamin A, Retinol (µg) feed	Initial Plasma Vitamin A Retinol (ng/ml)	Final Plasma Vitamin Retinol (ng/ml)	Time required to recover Vitamin A deficiency*
Children i. Male (n = 3) ii. Female (n = 5)	4 – 8	i. 10 ii. 10	i. 1200 ii. 1200	i. 115 ±5 ii. 120± 3	i. 132± 5 ii. 135± 2	10 days
Female (n = 10)	25 – 30	10	12000	115± 25	150± 5	15-18 days
Pregnant woman (n = 2)	i. 18 ii. 20	10	i. 12000 ii. 12000	i. 109± 40 ii.112±10	i. 145± 2 ii. 135± 5	18 days

* This is measured from the visual power, such as development of good sight after sunset / dark.



RESTORE GENDER RIGHTS AND EQUALITY
IT IS TOTALLY MISSING IN RURAL AREAS

FISHING TO EKE OUT A LIVING

AP

Women fishes with her bare hands during a community fishing programme

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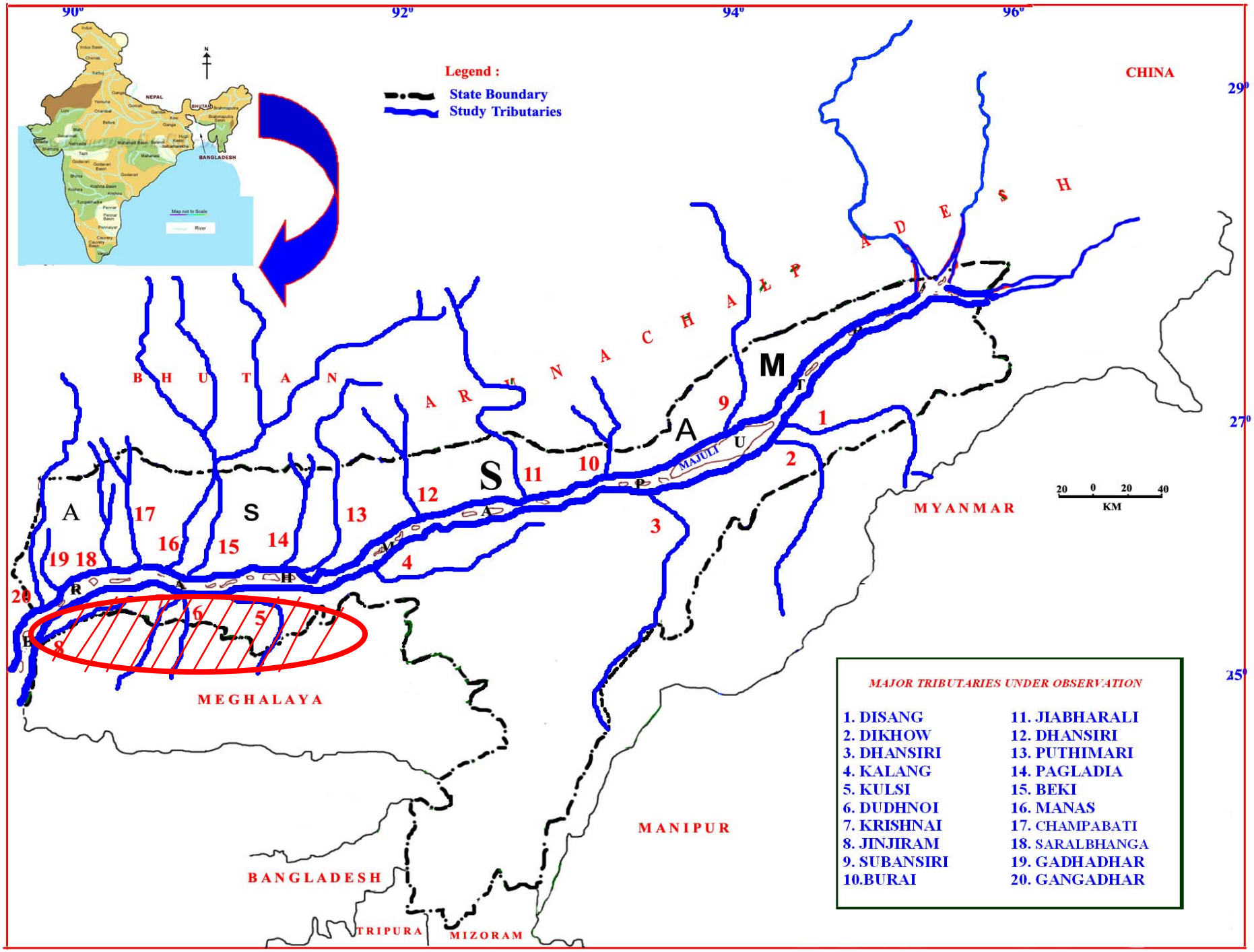
Teachers
Well-wishers

Restore Equal Nutrition Right and Stop Gender- Bias Family Nutrition Management……

Establish Empowerment to the Fisherwomen through proper Nutrition Management……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7. KRISHNAI
8. JINJIRAM
9. SUBANSIRI
10. BURAI
11. JIABHARALI
12. DHANSIRI
13. PUTHIMARI
14. PAGLADIA
15. BEKI
16. MANAS
17. CHAMPABATI
18. SARALBHANGA
19. GADHADHAR
20. GANGADHAR