

Part I

Report of the Community Based Study

Epidemiological study of health status of Population at Kasaragode District .Kerala

**Conducted by
Department of Community Medicine,
Government Medical College , Calicut.
Kerala.
2010-11**

**Chief Investigators:
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Funded by
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Methodology:

1. Selection of study areas

Stage 1

Area 1. According to the victims list prepared by the department of Health 11 out of 39 Panchayaths were reported to be worstly affected with endosulfan. Out of this 11 panchayaths one panchayath - Muliya was selected randomly which had maximum number of victims and presence of cashew estate owned by PCK and history of aerial spraying of endosulfan for long years.

Area II. From the list of rest 24 least affected panchayaths one panchayath – Kodombalur was selected by purposive sampling considering the geography and absence of cashew estate owned by PCK in its area.

Stage 2

Area I. From the selected Panchayath the field area of Muliya main sub center (Under Muliya CHC) was selected as field study area.

Area II. From the Kodombalur panchayath field area of Banam subcenter (Under Ennapara PHC) was selected. The area has no river or streams originating from up hills or any PCK estate in the nearby area which have ruled out any chances of drifting insecticides through water.

Stage 3

All the house holds included in the sub center registers of these 2 areas were included as study units.

Area I. Total 1200 houses

Area II. Total 850 houses (*source: DMO*)

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Result.

Sex ratio:

The sex ratio of the area 1 was 957 and the area 2 was 1016. Since the organochlorine insecticides are reported to alter sex ratio the decreased sex ratio in the area 1 was a matter of concern.

Distance from PCK estate.

In the area 1 - 52% of the house holds are staying within 1 km distance from the PCK estate and 17% are within 100 meters. In the area 2 all house holds were > 10 Km away from any of the PCK estates which were situated in the neighboring panchayaths. **(Fig 1)**

Any health events among domestic Animal. ((Cow, goat etc)

The informants were asked whether they have noticed any of the health events like death, abortion or congenital anomaly among the domestic animals in their home during the last years.

In the area 1 – 41 (3.5%) of the informants have noticed any one of the health events in their domestic animals and in area II it was only 4 (0.5%) (P=, 0001).

Relation of health events among domestic animals with distance to PCK in area I.

Distance from PCK	Total No	Events No	Percentage
< 100 meter	195	17	8.7
100 -500 meter	138	05	3.6
500 – 1 KM	263	06	2.3
> 1 KM	545	13	2.4

(P = 0.002.)

Morbidity:

1. Hospitalization.

One of the proxy indicators of health status of an area is hospitalization.. During the last one year period the hospitalization rate was almost double in area I indicating the severity of illness.

Table 3.

Health events	Area I -Muliyar		Area II- Banam		OR	95% CI	P value
	Number	%	Number	%			
Hospitalization < 1 year	293	4.8	110	2.9	1.67	1.33-2.08	<0.0001

Physical disability.

The physical disability among the persons of below the age 20 years most of which are due to congenital causes. Most of which are movement disability due to brain or limb anomalies. The details are given below.

Table 6. Prevalence and risks - Physical disability

Physical disability	Area I -Muliyar		Area II- Banam		OR	95% CI	P value
	Number	%	Number	%			
1- 9 years <i>(Born after 2000)</i>	5	0.5	7	1.4	0.38	0.12 – 1.21	0.084
10 – 19 years <i>(Born before 2000).</i>	13	1.1	1	0.2	6.7	0.87 -51.5	0.025

In the area 1 the aerial spraying was stopped since last 10 years and the children born after this have less risk (OR- 0.38) of developing physical disability and the children above the age of 10 had high risk (OR- 6.7) of physical disability.

The physical disabilities recorded among older age groups (>30 years) may be acquired /attributed due to other causes so we have excluded it from analysis.

Reproductive health events:

The reproductive health events listed were any treatment for infertility, history of abortion, history of intra uterine death (IUD)/ still birth, neonatal/ child death during a women's life time. The details were collected from all the married women in the areas.

All the events had high risks in area 1 and are also highly significant. (Table 7)

. Table 7.a .Reproductive Health Events

Reproductive Health Events	Area I - Muliyar		Area II- Banam		OR	95% CI	P value
	Number	%	Number	%			
1. Treatment for Infertility	104	1.7	31	0.8	2.08	1.39 – 3.31	<0.0001
2. Abortion	229	7.7	82	4.4	1.81	1.40 – 2.35	<0.0001
3. Intra uterine death + Still birth	64	2.1	18	1.0	2.26	1.33 – 3.62	<0.0001
4. Neonatal + Infant + Child deaths	100	3.3	43	2.3	1.47	1.03 – 2.12	<0.035

Age wise split also shown that those in area I with the age above 30 (whose reproductive period was during the period of aerial spraying 1980-2000) had high risk of these events and those with age <30 (whose reproductive period started after the cessation of aerial spraying) had reduced risks to these events which is still slight higher than area II.

Table 7. b

Age wise comparison of reproductive health events in area 1. Muliyar.

Reproductive Health Events	Age 20-29 years		Age 30-39 years.		Age 40-49 years	
	Number	%	Number	%	No	%
1. Treatment for Infertility	19	1.6	38	3.9	26	3.6
2. Abortion	53	4.3	73	7.4	47	6.5
3. Intra uterine death + Still birth	5	0.4	14	1.4	14	1.9
4. Neonatal + Infant + Child deaths	8	0.7	16	1.6	19	2.6

In comparison with those in older age groups (30 -49) the reproductive health events ever reported during the life time of a women from area 1- like abortion, Intrauterine death/still birth and child deaths were found to be reduced to 50% among the age groups (20-29years).. So in other words these events are lesser reported during the last 10 years

Compare to area 1 these events are lesser among the women in area 2 (table 7 C) and the reported reduction rate in these events are lesser than in Muliyar ; thus the historical effect can be ruled out in these events.

Table 7 c: Age wise comparison of reproductive health events in area II. Banam

Reproductive Health Events	Age 20-29 years		Age 30-39 years		Age 40-49 years.	
	Number	%	Number	%	Number	%
1. Treatment for Infertility	11	1.6	10	1.6	07	1.4
2. Abortion	17	2.5	27	4.3	22	4.5
3. Intra uterine death + Still birth	2	0.3	5	0.8	04	0.8
4. Neonatal + Infant + Child deaths	2	0.3	7	1.1	09	1.9

Age of menopause:

The mean age of menopause in all age categories were lower in area I. The pesticide may cause hormonal imbalances causing menstrual irregularities

The details are given in the table.8

Table 8. Age of menopause:

Age of women	Area I -Muliyar		Area II- Banam		P value
	Year	SD	Year	SD	
50 – 59 Years	40.1	15.9	46.1	6.6	0.001
60 – 69 Years	43.9	12.6	47.2	3.7	0.011
70 -79 years	44.4	11.1	47.0	4.5	0.131

Death in the family.

The details of death occurred in the house holds during the past 10 years were collected. Deaths among the family members were reported from 17% of houses in the area I (Total 231 deaths) and 16.3% houses from area II (Total 157 deaths).

The proportional mortality due to cancer, kidney diseases and brain tumor was high in area I.

Among the youth population (below the age of 40-) the rate of surgery for any heart diseases , hernia and genito urinary causes were higher in area 1 than II. Since they belonged to young age most of the causes are presumed to be due to congenital.

**Part II.
Report of the school study.**

Epidemiological study of health effects of endosulfan among adolescent population at Kasaragode District .Kerala.

**Conducted by
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2010-11**

**Chief Investigators:
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Methodology.

Corresponding to the field study 2 schools from each study area was selected.

Area 1: Muliyar Panchayath : BARHS Bovikanum. Where aerial spraying of Endosulfan was done for 20 years in the PCK estate located in the area till 2002.

Area 2: Kodom belur Government High school Kalichandukam. Where there is no history of aerial spraying of endosulfan and no PCK estate in the near by area.

Subject selection.

All the children enrolled in the school register in classes 8,9,10 who were willing to participate and attended the screening camps were selected as subjects...

Results:

Total data from 642 students were collected (1.BARHS Bovikanum 386. 2. GHS Kalichanadukam 259).

Boys comparison.

Variable	School 1		School 2		P value
	Mean	SD	Mean	SD	
Age n=183 n=140	14.56	1.36	14.46	1.40	0.964
Height N=183 N=131	156.44	10.96	159.44	10.96	0.015
Weight n=183 n=137	42.67	9.24	46.79	16.36	0.005

Death among the siblings:

Any death among the siblings – neonatal, infant and child death was collected by recall.

Table : 6

Details	School 1		School 2		Risk	95% CI	P value
	Number	%	Number	%			
1. Sibling death	35	9.5	17	6.6	1.41	.770- 2.57	0.167
2. Any anomaly	10	2.2	3	1.6	16.03	4.20 – 61.11	0.000

Any organ or limb anomaly was also high in school I.

Morbidity details :

Since pesticides are reported to cause seizure, asthma, skin diseases and alter the liver enzymes their details was collected .

The past history of seizure, asthmatic attacks, and jaundice was collected by recall or verifying past records. The skin disease was collected by clinical examination by doctors and eye/vision problems was collected by examination and presenting complaints.

Table 7.

Details	School 1		School 2		Risk	95% CI	P value
	Number	%	Number	%			
1..Any present illness	96	25.6	20	8.6	3.65	2.18- 6.07	0.000
2.Seizure	12	3.1	4	1.5	1.63	0.587- 4.68	0.257
3..Asthma	25	9.7	18	4.8	1.36	.626 – 2.95	0.281
4..Skin diseases	76	19.8	29	11.2	1.94	1.23 -3.08	0.003
5..Vision problem	70	18.0	17	6.6	3.15	1.81 -5.50	0.000
6.Past history of jaundice	10	2.6	6	2.3	Not Done	Not Done	Not Done

The school I had high prevalence of any present illness (OR 3.65 , P=<0.0001)

1.Seizure:

In the school 1 - 12 students are having history of seizures in the past of which only 3 are having current episodes and in the school 2- 4 have history of seizure in the past and currently one have any current episodes.

Asthma: 25 (9.7%)students from the school 1- have history of asthma in the past of which only 5 (1.3%) had an attack during the last 1 year and in school 2 - 18(4.8%) have history of asthma in the past . 3 (1.2%) had an attack during the last 1 year. There was a marked reduction of symptoms of asthma in the school 1.

Skin disease: We recorded all skin conditions present during the day of survey and for analysis Allergic/contact dermatitis, eczematous lesions were considered. The school 1 had increase prevalence of skin problems e recorded by the doctors.

The eye problem recorded were refractory errors, eye strain ,reading difficulties, increased watering , pain etc. 3 fold students of the school 1 had any of this complaints.

History of jaundice was elicited by recall. The prevalence of past history of jaundice have not much difference .

The ratio of prevalence of any hypersensitive disorders (Allergic dermatitis, Eczema, Bronchial asthma): 101:47

Details of congenital anomalies;

Any organ anomaly and Congenital heart disease were higher in school 1. The congenital heart disease was diagnosed either from old records or by detailed clinical examination and history.

Children with short stature was recorded (n=10)only from school 1. They are also having delayed mile stones of puberty.

Endocrine and hormones.

Comparison of hormone values:

We had collected blood from the sub samples and hormone estimation was done. School 1- 98 samples , School 2- 97 samples.

2. Sex hormones:

Boys

Variable	School 1 N=49		School 2 N=45		P value
	Mean	SD	Mean	SD	
Oestrogen	29.18	47.09	16.55	21.74	0.103
Testosterone	2.51	2.42	2.93	2.46	0.402
FSH	4.53	5.37	9.83	6.26	0.001
LH	3.43	4.09	2.09	2.12	0.068

Girls :

Variable	School 1 n=45		School 2 N=46		P value
	Mean	SD	Mean	SD	
Oestrogen	72.60	80.49	67.90	59.34	0.752
Testosterone	1.18	2.77	1.05	0.96	0.761
FSH	7.97	4.58	16.30	10.77	0.001
LH	6.65	8.39	9.50	12.26	0.198

Summary and conclusion. :

Corresponding to the field study 2 schools from each study area was selected. Area 1: Muliyar Panchayath : BRHS Bovikanum. Area 2: Kodom belur Government High school Kalichandukam.

The mean age of both schools were comparable 14 years. The height , weight of school 1 was lower than school2.

The prevalence of present morbidity was higher in the school 1
Death among the siblings were 9.5% and 6.6% respectively.

Any organ anomaly and Congenital heart disease were higher in school 1

The surgery due to any birth defects were high in school 1

In the school 1 – 3.1% students and in the school 2- 1.5% have history of seizure

9.7%students from the school 1- and 4.8% in school 2 -have history of asthma with marked reduction current episodes in school 1. .

. The school 1 had increase prevalence of skin problems (20%) compared to 2 (11%) .

3 fold students of the school 1 had any of this eye problem /complaints (18%:6%).

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The age of attaining menarche among the girls of the school1 –(13.2 years) was higher than school 2. (12.6 years)

The students of school 1 had a higher level of oestrogens and lower Follicular Stimulating Hormones (FSH) and (Leutenising Hormones) LH levels.

Part III

Report of the

Estimation of Endosulfan Residues in human blood at Kasaragode

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Material and methods.

Design: Observational study

Study area: Study area was selected by purposive sampling. 11 panchayaths in Kasaragode district of Kerala (Table 1) which are reported to be affected with hazards of endosulfan and with history of aerial spraying endosulfan in the past..

No	Name of Grama Panchayath	Block Panchayath
1	Badiadaka	Manjeswar
2.	Bellur	-Do-
3.	Enmakaje	-Do
4.	Kumbadaje	-Do
5	Karadka	Kasargode
6	Muliyar	-Do
7	Ajanur	Kanchgad
8	Kallar	-Do
9	Panathady	-Do
10	Pullur periya	-Do
11	Kayyur- Cheemeni	Nileshwar

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Results:

We could collect data from 43 persons and collect blood samples from 41 persons. 39 from camps and 4 from house visits .2 from the victim list had rejected to take blood samples.

The area, age, sex, apparent health status and endosulfan residue levels were given in the table below.

Endosulfan Residues (ppb) in human blood plasma.

	Name of Panchayth	Age , Gender of the Person	Alfa	Beta Endosulfan	Endosulfan Sulphate	Total Endosulfan
1	Pullur Periya	45 M	3.83	BDL	BDL	3.83
2	Pullur Periya	35 F Expired	Blood	Sample	Not	Taken
3	Pullur Periya	62 F	Blood	Sample	Not	Taken
4	Pullur Periya	37 F	4.70	BDL	BDL	4.70
5	Pullur Periya	24 F	4.50	BDL	54.14	58.63
6	Pullur Periya	24 M	13.33	BDL	148.57	161.90
7	Kayyur Chemeni	32 F	7.29	BDL	22.71	30.00
8	Kayyur Chemeni	F 51	8.83	BDL	BDL	8.83
9	Kayyur Chemeni	M 38	9.90	BDL	40.80	50.70
10	Ajanur	M 56	4.27	BDL	44.92	49.18
11	Ajanur	F 35	5.33	BDL	47.19	52.53
12	Ajanur	F 42	4.50	BDL	BDL	4.50
13	Panathadi	F 29	4.08	BDL	68.11	72.19
14	Panathadi	F 47	5.42	BDL	40.73	46.15
15	Panathadi	F 30	15.38	BDL	BDL	15.38
16	Kallar	M 40	16.25	BDL	72.17	88.42
17.	Kallar	M 21	11.00	BDL	64.90	75.90
18	Kallar	M39	9.40	BDL	67.00	76.40
19	Kallar	F 30	12.95	BDL	33.41	46.35
20	Muliyar	F 25	11.17	BDL	BDL	11.17
21	Muliyar	M 15.	9.39	BDL	BDL	9.39
22	Muliyar	F 38	4.16	BDL	BDL	4.16
23	Muliyar	M 40	4.30	BDL	BDL	4.30
24	Muliyar	F 34	2.58	BDL	BDL	2.58
25	Bellur	F 35	5.94	BDL	40.64	46.58
26	Bellur	F 38	5.86	BDL	45.67	51.53

27	Badiyaduka	F 10		3.90	BDL	BDL	3.90
28	Badiyaduka	F 44		3.63	BDL	BDL	3.63
29	Badiyaduka	F 42		14.18	BDL	96.00	110.18
30	Badiyaduka	F 43		5.78	BDL	BDL	5.78
31	Badiyaduka	F 15		4.29	BDL	BDL	4.29
32	Badiyaduka	F 59		13.00	BDL	35.13	48.13
33	Karadukka	F 37		8.48	BDL	104.00	112.48
34	Karadukka	F 26		4.20	BDL	19.77	23.97
35	Karadukka	F 25		2.97	BDL	25.67	28.64
36	Karadukka	F		3.77	BDL	27.52	31.28
37	Kumbadeje	M 32		12.40	BDL	158.00	170.40
38	Kumbadeje	F 12		3.04	BDL	BDL	3.04
39	Kumbadeje	F 23		2.66	BDL	41.19	43.85
40	Enkameja	M 41		4.33	BDL	BDL	4.33
41	Enkameja	M 27		2.21	BDL	BDL	2.21
42	Enkameja	M 30		3.14	BDL	16.24	19.38
43	Enkameja	F 38		19.68	BDL	97.50	117.18

BDL = below 1ppb.

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