Application for ***Ad-hoc*** Research Project

Towards Developing a National Epilepsy Control Program: A Pilot, Community-Based, Randomized Trial of Delivery of Care to People with Epilepsy

By

Departments of Neurology & Social and Preventive Medicine

At

Dayanand Medical College, Ludhiana

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INDIAN COUNCIL OF MEDICAL RESEARCH

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APPLICATION FOR GRANT-IN-AID OF AD-HOC RESEARCH PROJECT

Section – A

GENERAL

1. **Title of the Research Project:** Towards Developing a National Epilepsy Control Program: A Pilot, Community-Based, Randomized Trial of Delivery of Care to People with Epilepsy.

2. Names and Designation of

i) Principal Investigator	Dr. Gagandeep Singh Professor & Head, Department of Neurology, Dayanand Medical College, Ludhiana. Email: gagandeep_si@yahoo.co.uk
ii) Co-investigator	Dr.Anurag Chaudhary Professor & Head, Department of Social & Preventive Medicine, Dayanand Medical College, Ludhiana.
iii) Co-investigator	Dr.Jatinder S. Goraya, Assistant Professor Department of Pediatric Neurology, Dayanand Medical College, Ludhiana.
iv) Co-investigator	Dr. Sarit Sharma Professor Department Community Medicine, Dayanand Medical College, Ludhiana.
v) Co-investigator	Dr. R.K. Setia Scientist SD Punjab Remote Sensing Centre, Ludhiana
vi) Collaborator	Dr. Krishna D. Rao Centre for Mental Health

	Public Health Foundation of India (PHFI) 14, Community Centre, Panscheel Park, New Delhi - 110 016 INDIA
vii) Collaborator	Dr. Susmita Chatterjee Centre for Mental Health Public Health Foundation of India (PHFI) 14, Community Centre, Panscheel Park, New Delhi - 110 016 INDIA

3. Duration of Research Project:

i) Period, which may be needed for collecting the data: 2 years 6 months

ii) Period that may be required for analyzing the data: 3 months

iii) Writing the final report and research paper: 3 months

4. Amount of grant-in-aid asked for (details are to be furnished in Section B)

	1st year	2nd year	3rd year	Total
Salary	Rs. 10, 59, 840	Rs. 10, 59, 840	Rs. 10, 59, 840	Rs. 20, 93, 760
Recurring				
Field Trips/Medicines	Rs. 13, 08, 000	Rs. 11, 04, 400	Rs. 14, 400	Rs. 24, 22, 800
Non recurring				
Equipment/ consumables	Rs. 1, 50, 000	Rs. 1, 44, 000	Rs. 1, 90, 000	Rs. 4, 84, 000
Others				
Travel/ Statistical analysis		Rs. 30, 000	Rs. 1, 74, 000	Rs. 2, 04, 000
Total				Rs. 50, 60, 560
DMC&H charges @3% of total				Rs. 1, 51, 816.8
Grand Total				Rs. 52, 12, 376.8

Final Total= Rs. 52, 12, 377

5. Institutions responsible for the research project

Name	Dayanand Medical College, Ludhiana
Postal Address	Department of Neurology, DMC, Tagore Nagar, Civil lines, Ludhiana 141001.
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6. Institutional ethical clearance and Project approval (Necessary documents indicating Institutional ethical clearance must be enclosed for research involving human subjects as also animal experiments). **Yes (Refer Annexure XX)**

7. Is radio tagged material proposed to be used in the project either for clinical trials or experimental purposes? If so, clearance from Nuclear Medicine Committee, Bhabha Atomic Research Centre, Mumbai, indicating should be attached. **Not applicable**

8. Projects involving recombinant DNA/Genetic engineering work should be examined and certificate by the Institutional Biosafety Committee (IBSC) to be enclosed. Guidelines for constitution of IBSC can be obtained from Secretary, Department of Biotechnology, CGO Complex, Lodhi Road, New Delhi-110003. **Not applicable**

9. Approval of the institutional ethics committee (**IEC**) should be enclosed. Guidelines for IEC for animal experiments should follow CPCSEA requirements and for human studies should follow ICMR guidelines.

10. The Institution where the study is being done should ensure that there is no financial conflict of interest by the investigators.

9. DECLARATION AND ATTESTATION

i) We have read the terms and conditions for ICMR Research Grant Necessary Institutional facilities will be provided if the research project is approved for financial assistance.

ii) We agree to submit within one month from the date of termination of the project the final report and a list of articles, both expendable and non-expendable, left on the closure of the project.

iii) We agree to submit audited statement of accounts duly audited by the auditors of the Institute.

Signature of:

Principal Investigator

(Dr. Gagandeep Singh)

Co-Investigator

(Dr. Anurag Chaudhary)

Co-Investigator

(Dr. Jatinder Singh Goraya)

Co-Investigator

Dr. Sarit Sharma

Co-Investigator

(Dr. R.K Setia)

Head of Department

(Dr. Gagandeep Singh)

Head of Institute

Principal
Dayanand Medical College,
Ludhiana

Dayanand Medical College & Hospital
Ludhiana, Punjab

Seal of the Head of Institute

Dated: 27/12/2014 (Permission Granted. Permitted to send advance copy)

Section – B

DETAILS OF THE RESEARCH PROJECT

1.0 Title of the project:

A Pilot Community-Based Cluster Randomized Trial of Home-based, Health Worker-provided Care versus Routine Clinic-based Care for People with Epilepsy.

2.0 Objectives

2.1. Overall Objective: To study regular (weekly), home-based care (including patient and family education, AED provison and monitoring compliance) in the community compared with routine clinic-based care provided by a neurologist as a method of provision of care to people with epilepsy.

2.2. Primary Objective: To compare the effects of regular (weekly), home-based care (including patient and family education, AED provision and monitoring compliance) in the community with routine clinic-based care provided by a neurologist on AED adherence in people with epilepsy.

2.3. Secondary Objectives:

2.3.1. To compare the effects of the two health care delivery methods described above on seizure control in people with epilepsy.

2.3.2. To compare the effects of the two health care delivery methods described above on quality of life, as measured by an Indian version of QOLIE 31 in people with epilepsy.

2.3.3. To determine the cost effectiveness of regular (weekly), home-based care (including patient and family education, AED provision and monitoring compliance) for people with epilepsy in the community in comparison to

routine clinic-based care provided by a neurologist.

3.0 Summary of the proposed research

A large proportion of epilepsy patients in resource-poor countries like India do not get appropriate treatment for a variety of reasons. Poverty, lack of availability of anti-epileptic drugs, superstitions and cultural beliefs, lack of adherence, limited availability of neurologists (often working only in urban areas), non-availability of clinical epileptological assessments, account for the treatment gap in people with epilepsy. At present, the provision of care to PWE in India essentially revolves around outpatient-based clinics, which provide advice and in some instances medication to PWE. The major problem with this model of care is that people often do not come back for follow-up to the clinics. Another problem is that very little time is available for counseling PWE and their families as most outpatient clinics in India are very busy. We propose an alternative model in which epilepsy medications and health education are provided by health workers at homes of PWE and envisage a comparative trial of home-based care with routine clinic-based care. The effects of the two types of intervention on outcome measures including seizure control, quality of life and AED adherence will be studied. Treatment gap in PWE in the community can be reduced by educating them about the positive features of life with epilepsy, scaling up routine availability of low-cost anti-epileptic drugs, monotherapy and cost-effective epilepsy surgery programs, thus improving the quality of life of people with epilepsy. This can be effectively done by identifying the best possible way of reaching out to them and providing the best possible care to them.

3.1 Aims

3.1.1. Primary Aim: To compare the effects of regular (weekly), home-based care (including patient and family education, AED provision and compliance monitoring in the community with routine clinic-based care provided by a neurologist on AED adherence in people with epilepsy.

3.1.2. Secondary Aims:

3.1.2.1. To compare the effects of the two health care delivery methods described above on seizure control in people with epilepsy.

3.1.2.2. To compare the effects of the two health care delivery methods described

above on quality of life, as measured by an Indian version of QOLIE 31 in people with epilepsy.

3.1.2.3. To determine the **cost effectiveness** of regular (weekly), home-based care (including patient and family education, AED provision and monitoring compliance) for people with epilepsy in the community in comparison to routine clinic-based care provided by a neurologist.

3.2 Methods

The community-based **randomized** study will involve 30-cluster sampling approach to select the study population (37, 38). Approximately 75% of the study population (45,000) will be selected from urban and 25% (15,000) from rural areas. For the rural community, the population will be chosen from Malaud Block (population 85789) in Ludhiana District (Fig. 2). The urban population will be selected from Shimlapuri in Ludhiana District (total population 54, 236) (Fig. 3). All these communities lie partly in the field practice area of the Department of Social and Preventive Medicine, Dayanand Medical College, Ludhiana.

Thirty clusters of an average size of 2000 people will be selected with probability proportional to the lines suggested by the World Health Organization (WHO) for assessment of vaccine coverage. Within each cluster a starting household will be randomly selected. Selection would begin in the starting household and then continue to the next nearest household until a total of 2000 individuals is obtained. All individuals in the last household falling into the sample will be included, even if that means including few more individuals in the cluster rather than the required minimum number of 2000.

All people will be screened for epilepsy using a validated questionnaire. The screened positive subjects will undergo neurological assessment followed by comprehensive epileptological assessments. The assignment to either of the two interventional arms will be carried out by computerized randomization, in which PWE will be **randomized** to either of the two groups. The two arms will be:

(i) Control arm: Routine clinic-based care - People with epilepsy enrolled under this arm will attend a monthly epilepsy care clinic for follow-up. A reminder system for both appointment and medication refills will be followed.

(**ii) Interventional arm: Home-based health worker guided AED provision and health education** – This will involve bimonthly visits to the patients' houses by health care workers, providing them with AEDs, recording adherence, side effects and response to treatment. Patients and their care-givers will also be educated on management of epilepsy. The 3 principal aims of the home visit will be to provide a supply of AEDs, educate patients and their families about coping with the disorder and monitor compliance.

The estimated sample size for the community survey is 60,000 and it is estimated that 600 epilepsy cases will be recruited from the master sample.

Following cluster randomization, the two groups will be followed up for 18 months for each of the outcome parameters described below.

3.3 Outcome measures:

The following outcome will be assessed by an independent blinded investigator who is not otherwise a member of the study team.

(i) **Seizure control** - Primary outcome measures will be time to treatment failure and time to 12 month remission.

Time to 12 month remission from seizures, will be defined as the number of days between randomization and end of a period of 12 months without seizures.

Treatment failure will be defined as the number of days between randomization and occurrence of a seizure or any side effect that leads to the discontinuation of the AED.

(ii) **Quality of life of PWE** –The total score and individual scores of the seven domains of QOLIE-31 will be noted and compared at the end of the follow up period in the two interventional arms.

(iii) **Adherence- Adherence** will be assessed by pill count. In addition, the subjects will be administered the following questionnaires: Brief Medication Questionnaire (BMQ), Self-reported medication-taking scale and item to total correlation coefficients and Epilepsy self-management questionnaire, and the scores will be assessed for adherence.

An economic analysis, i.e., cost-effectiveness of either study arm and cost benefit of the interventional arm over the control arm will be calculated using the human capital approach.

4.0 Present knowledge and relevant bibliography

Epilepsy is a common neurological disorder and a major public health concern affecting 50 million people worldwide and involving an additional 500 million people as family members and caregivers of patients (1, 2). In 2004, the WHO estimated that nearly 80% of the burden of epilepsy worldwide is borne by the resource-poor countries. In a meta-analysis of data obtained from 20 community-based prevalence studies on epilepsy in India, a prevalence rate of 5.3 per 1,000 person-years (95% CI 4.3 to 6.4) was derived (3). In another three-phase survey conducted in central Kerala, southern India an age-adjusted prevalence of 4.7 per 1,000 person-years was obtained (4). On the basis of a prevalence rate of 5 per 1,000 person-years and an incidence rate of 50 per 100,000 person-years, it is estimated that at any given time, India, with its population of over one billion inhabitants, will have at least five million people with active epilepsy, to which nearly 500,000 people are added annually.

In any community, for a chronic disorder such as epilepsy, the provision of care is essentially a **three-step process** (Fig. 1). Accordingly, deficiencies in provision of care to people with epilepsy might be divided in to deficiencies at the time of diagnosis, problems associated with access to care and problems associated with maintenance of treatment (or adherence). We plan to address the third step in the process of provision of care, i.e., **measures to improve adherence** in this project proposal.

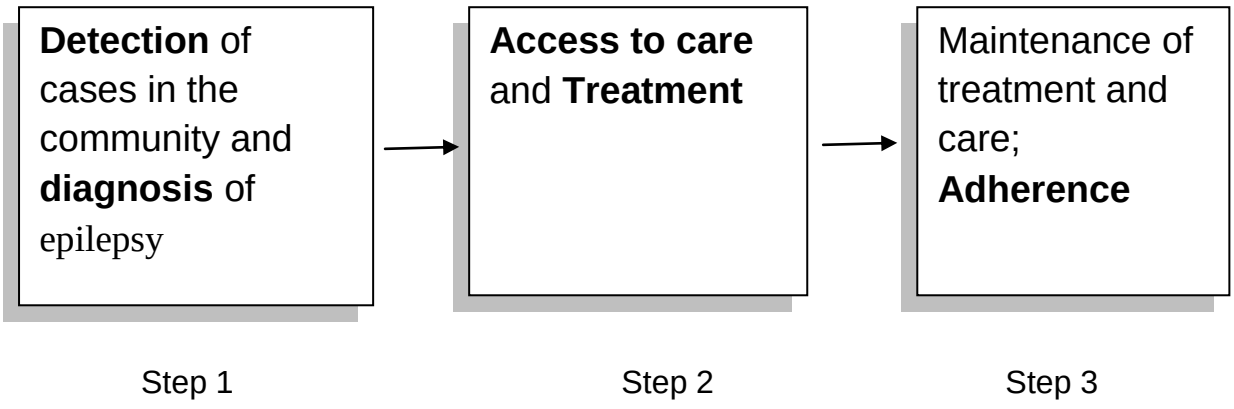


Figure 1. Steps in the process of care for epilepsy in a community

4.1 Problems in diagnosis

A number of factors might be responsible for failure to diagnose epilepsy in the community. People with epilepsy and their families often wish to conceal their condition from others due to stigma associated with epilepsy, false beliefs of it being attributed to supernatural causes, apprehensions about the cost of treatment etc. In addition, diagnosis depends upon the availability of neurologists in the community. India, with around 1,000 neurologists, has one neurologist to one million people, which translates into one neurologist to care for 5,000 people with epilepsy (5). Furthermore, nearly two-third of people in resource-poor countries reside in rural areas, while nearly all the neurologists in these countries practice in or close to large cities and towns (6). As a consequence, most people with epilepsy in resource-poor countries are diagnosed, treated and followed by primary and secondary care physicians who have no specific training or expertise in epilepsy management.

4.2. Access to care (Treatment gap)

A large proportion of people with epilepsy in resource-poor countries do not receive appropriate treatment for their disease, a phenomenon known as treatment gap (7,8). Treatment gap is defined as the number of people with active epilepsy not on treatment or on inadequate treatment (1,7). A recent systematic analysis that investigated the magnitude of treatment gap for epilepsy in resource-poor countries found an overall rate of 56% (95% CI 31-100%) (8). Failure to seek treatment right from the beginning is often related to misbelieves, stigma and apprehensions of the cost of treatment as is known as **"primary treatment gap".**

Table 1: The main causes of the treatment gap along with median and range (8).

S. No.	Causes of the treatment gap	Median	Range
1.	Cost of treatment	62%	11-90%
2.	Non-availability of AEDs	53%	18-44%
3.	Belief in traditional treatment	44%	6-82%
4.	Superstitions and cultural beliefs	40%	7-65%

A large proportion of epilepsy patients even after diagnosis and initiation of AEDs, discontinue the treatment. This phenomenon is known as **secondary treatment gap** (9). In a prospective observational study of 1450 patients in an urban clinic in northeastern India, 620 (43%) patients discontinued their treatment within one year (9). The principal reason cited for AED discontinuation was the inability to afford the treatment and lack of information about the consequences of medication non-adherence.

An economic analysis that set out to establish the expected costs and cost-effectiveness of first-line AEDs (that is, phenobarbitol, phenytoin, carbamazepine and valproic acid) concluded that the current large treatment gap in resource-poor countries could be reduced by scaling up the routine availability of low-cost AEDs such as phenobarbitol and phenytoin.
(10). Unfortunately, most patients with epilepsy in resource-poor countries are treated with multiple and often expensive AEDs simultaneously. In a study undertaken in a tertiary referral center in South India, it was seen that nearly 58% of 972 patients were receiving polytherapy with AEDs at the time of referral from primary and secondary care facilities (16). Among the patients on polytherapy, 95% were receiving inadequate doses of AEDs. The simultaneous use of multiple AEDs caused the cost to escalate enormously. A sizeable proportion could be weaned off unnecessary AEDs, resulting in better seizure control, fewer adverse effects and financial savings.

4.2.1. Social Issues

The misunderstanding of epilepsy and the resulting social stigma often cause more stress to a person with epilepsy than the seizures themselves (11). In resource-poor countries epilepsy continues to be a highly stigmatizing condition (12,13,14,15). In spite of a high degree of awareness of epilepsy among people in resource-poor countries, the attitudes towards this condition are far more negative than in developed countries. The psychosocial consequences of the stigma potential of epilepsy are most evident in the case of women with epilepsy of marriageable age.

In many parts of the world, epilepsy continues to be viewed as witchcraft, contagious, and as possession by devils and ancestral spirits (18). An Indian study reported that 15% of respondents believed epileptics to be insane, 40% believed

that the children with epilepsy should not go to school or their children should not play with them and 66% objected in their children marrying someone who had epilepsy (19). Similar observations were found in a study from Taiwan which also reported that 31% of respondents believed that people with epilepsy should not be employed in jobs (20).

4.2.2. Quality of Life (QOL)

Epilepsy carries an enormous social stigma and people with epilepsy tend to have lower quality of life (QOL)(17). They are prone to have poorer self-esteem, higher levels of anxiety, and depression. They are more likely to be underemployed or unemployed with lower rates of marriage and greater social isolation (21,22).

In an Indian study conducted in Belgaum, Maharashtra, it was found that control of seizures, monotherapy, and educating people regarding epilepsy helped to improve QOL in patients with epilepsy (23). Although there are numerous studies assessing the QOL of people with epilepsy from all over the world, similar studies from resource-poor countries, especially India are few. It is necessary to ascertain the magnitude of the problem as a part of the systematic approach to challenges in epilepsy management.

4.3. Adherence

For patients with epilepsy, AEDs are commonly used to control seizure activity and the successful control of seizures partly depends on patients ability to follow their physicians orders, including about how to take medications (24). Taking AEDs as ordered (adherence) is difficult for some patients. Side effects, interference with daily life, expense, forgetting, avoiding stigma and dependence are some of the reasons reported for not taking medications consistently (25, 26, 27). The concept of adherence is important because negative outcomes such as increased seizure frequency, increased hospital admissions, loss of employment, status epilepticus and death are related to non-adherence (28). Over the last decade the reported rates of non-adherence with AEDs ranged from 15-71% (25,31). Different methods have been used to measure medication adherence including plasma medication concentration, patient interview and self-report, pill counts, prescription refill dates and seizure frequency. Taking serum level AEDs has also been used in several studies (26,32,33). Each method has some medication flaws and no “gold standard” for measuring adherence exists.

Multiple strategies might improve medication adherence rates, such as patient counseling, special medication containers and a reminder system for both appointment and medication refills (29). Simplifying medication-taking regime (switching to extended-release formula) also improved adherence (34). Further, an increase in the number of clinic visits has also shown to improve adherence (30).

4.4. Overview of Community Interventions to provide Care to People with Epilepsy

A Global Campaign Against Epilepsy (39) is necessary because the burden of epilepsy on individuals and communities is far greater than previously realized and is being conducted by the World Health Organization (WHO) in partnership with the International League Against Epilepsy (ILAE) and the International Bureau for Epilepsy (IBE). The aims of the campaign are to provide better information about epilepsy and its consequences and to assist governments and those concerned with epilepsy to reduce the burden of the disorder by organizing Demonstration projects in selected countries in different regions.

4.4.1 Approaches in Malawi, Kenya, West Bengal, Bengaluru and China

4.4.1.1 Malawi

A simple treatment model (40) was designed to address some of the constraints.

i) It incorporated wide publicity of accessible services, easily available, free, and simple treatment with pheytoin or phenobarbitone, adequate supply of medication, frequent follow-up and continuity of follow-up.

ii) Health workers had to be used in view of the low ratio of physicians to population.

iii) The education of the local population and people with epilepsy was crucial. Awareness about the disorder was given in culturally relevant terms.

iv) After 8 months, 11 individuals received treatment in hospital. Following a publicity campaign 70 additional people received AEDs over the following three months. After two years 461 patients were registered at the hospital. After six months of treatment, 56% of patients had no seizures whereas before treatment 88% had one seizure per month.

4.4.1.2 Kenya

WHO has recommended that community health workers diagnose and treat tonic-clonic seizures. Using this key informant approach a study was conducted in a rural district of the Rift Valley in South-West Kenya (41). The study ensured effective case ascertainment and used a simple model of treatment and follow-up.

i) A health worker was allocated to each person with epilepsy and educated them about the condition and the importance of compliance.

ii) A non-specialist physician conducted a monthly hospital follow-up of these people on simple regimens of carbamazepine or phenobarbitone.

iii) Easy and urgent access was facilitated for people experiencing side effects.

iv) Of the 302 people recruited in the study, a compliance rate of 82% was observed in the 12 months of follow-up. Of these 53% were seizure free for 6-12 months, 25% of them were without seizures for 12 months and further 26% had reductions in seizure frequency.

v) **Community based approach** – The authors suggested that the reduction in seizures had much to do with the community based approach. The treatment protocols were suitable for use by non-physicians and enabled the health workers to take a leading role in diagnosis, education, adjustment of drug doses, monitoring treatment and ensuring compliance. A psychiatrist confirmed their diagnosis and reviewed their work. However there were difficulties in diagnosing rarer forms of seizures.

This study model emphasized the feasibility of delivering appropriate care in developing countries through the primary health care system.

Sustainability – Although both this model and that from the study in Malawi efficiently treated PWE, were initially successful and provided methods which could be adopted elsewhere, an additional constraint has jeopardized their achievements in the longer term. The programmes came to a halt after the people who had established moved away. Issues of sustainability are essential for an intervention's success.

4.1.3 West Bengal, India

A study in rural West Bengal (42) resolved issues of sustainability. Workers in two local non-government organizations (NGOs) received training in case ascertainment and informing communities about epilepsy. The NGOs were already involved in community-based health care and the epilepsy service was integrated into the rest of their health care provision. This offered a low cost alternative to other forms of intervention and meant that epilepsy services became part of organization already committed to their communities in the long term. When the study was finished epilepsy service continued to be provided.

4.4.1.4 Further approaches to bridging the treatment gap

An Indian Program, established by the National Institute of Mental Health and Neurosciences in Bangalore (43) attempted to circumvent many of the anticipated problems of treatment programmes in developing countries. It was estimated that for a country's population of one billion there were only 500 neurologists and many health care professionals lacked adequate expertise in the diagnosis and management of epilepsy.
The following two-pronged approach was proposed:

i) A top down strategy of strengthening district hospitals, ensuring an uninterrupted supply of antiepileptic drugs, and using mobile teams for remote rural areas.

ii) A bottom up strategy of training health professionals in case detection, diagnosis and management.

In 1999, three workshops were held for training district medical officers in the diagnosis of epilepsy, management and psychological aspects. An evaluation of their knowledge of epilepsy was done before and after training. The aim was to achieve a state model of epilepsy treatment.

The Chinese approach

A demonstration project under the Global Campaign Against Epilepsy has begun its implementation in seven counties of five provinces in northern and eastern China (44). The main aspects of the program are focused on knowledge, attitudes and practices. It was intended to bring about a change in the traditional and cultural

attitudes so that stigma of epilepsy is reduced and more people are prepared to receive treatment. In order to make treatment more successful, village doctors were to be trained to diagnose and treat epilepsy correctly and a protocol for the use of phenobarbitone has been developed.

4.5. Important Recommendations for Implementation in India

Experience in West Bengal and China clearly showed that sustainability of the intervention in the long-term (essentially amounting to an uninterrupted supply of AEDs) is critical to the success of any community care program for epilepsy in the long-term. Thus, keeping in mind the medical, social and economic challenges and the results of the demonstration projects conducted in different countries we conclude that treatment gap of the people with epilepsy in communities can be minimized by the following measures:-

1. Evolving simple, safe and effective standardized treatment models.
2. Ensuring uninterrupted supply of low cost AEDs at nominal rates.
3. Improving health care facilities for people with epilepsy in communities by regularly educating primary and secondary care physicians to diagnose and treat patients with regard to current trends in epilepsy. Such training programs about recent advances in epilepsy management will decrease the phenomenon of inadequate polytherapy.
4. Health education of patients and public to remove misconceptions and beliefs about the disease, to help them to understand the need of AEDs and its adherence.
6. Assessment of the impairment in their quality of life (QOL) due to effects of epilepsy on various aspects of their life and the medication effects. Cost-effective epilepsy surgery programs should be developed in selected centers.
7. The need for improvement in sanitation has to be emphasized to reduce the burden of epilepsy in the area.

4.6. Rationale for Home-based Care

The concept of home-based care provided by health workers is different from any of the models described above. Home-based care was essentially conceptualized in order to address the issue of non-adherence and high rates of secondary treatment gap in India. It also permits patient education, which can be easily undertaken by

non-specialists (other than neurologists), including health workers and which is not possible in the limited and busy neurologic clinics (in which several other disorders are prioritized over epilepsy). Finally, the concept has been derived from the application of directly observed therapy for tuberculosis (DOTS), which now forms an essential component of the Revised National Tuberculosis Control Program (RNTCP). The DOTS was pilot tested in the 1990s and has now been scaled up to cover nearly the whole nation and as a result cure rates for tuberculosis have doubled in comparison to the earlier national tuberculosis program. We hypothesize that ***"Regular home-based care in the community by routine health workers will improve adherence to AEDs, reduce secondary treatment gap and facilitate patient and family education about the disorder thereby leading to improved seizure control and quality of life for people with epilepsy."***

4.7. Research Question

In keeping with the study hypothesis alluded to above, the research question is as follows:

"Does regular home-based care by routine health workers (comprising health education, AED provision and monitoring compliance) in the community improve adherence to AEDs, thereby improving seizure control and quality of life in people with epilepsy?"

This research question will be pilot tested in the study protocol described hereunder.

4.8. Proposed Pilot Project

The community-based **randomized study** will involve an initial door-to-door screening survey for epilepsy in the slum area. All people will be screened for epilepsy using a validated questionnaire. The screened positive subjects will undergo neurological assessment followed by comprehensive epileptological assessments. The assignment to either of the two interventional arms will be carried out by **randomization**, in which all identified PWE will be randomized to either of the two interventional groups. The two interventional arms will be:

4.8.1. Routine clinic-based care

People with epilepsy enrolled under this arm will come for a monthly medical check-up, discuss about their disease and obtain medications. This monthly epilepsy care clinic will be conducted on a pre-decided date and place in the community. A reminder system for both appointment and medication refills will be followed.

4.8.2. Home-based health worker-guided AED provision and health education

This arm will involve a weekly visit to the patient's houses by trained field workers. The latter will counsel the patients regarding adherence, monitor the patients for side effects and response to treatment on a weekly basis, solve problems that might interrupt treatment and dispense medicines for the coming week. Complete documentation of the weekly visits will be done.

References

1. Kale R. Global campaign against epilepsy: the treatment gap. Epilepsia 2002;43:31-33.
2. World Health Organization. Epilepsy in the WHO Africa region, Bridging the gap: the

   Global campaign against epilepsy "Out of the Shadows". (WHO Press, Geneva, 2004).
3. Sridharan, R. & Murthy, B. N. Prevalence and pattern of epilepsy in India. Epilepsia 1999 ;40: 631-636.
4. Radhakrishnan K et al. Prevalence, knowledge, attitude, and practice of epilepsy in Kerala, South India. Epilepsia 2000;41:1027-1035.
5. Singhal BS. Neurology in developing countries: a population perspective. Arch Neurol 1998;55:1019-1021.
6. Mani KS. Global campaign against epilepsy. Agenda for IEA/IES. Neurol India 1998;46: 1-4.
7. Meinardi H, Scott RA, Reis R, Sander JW. The treatment gap in epilepsy: the current situation and ways forward. Epilepsia 2001;42:136-149.
8. Mbuba CK, Ngugi AK, Newton CR and Carter JA. The epilepsy treatment gap in developing countries: a systematic review of the magnitude, causes and intervention strategies. Epilepsia 2008;49:1491-1503.
9. Das K, et al. Evaluation of socio-economic factors causing discontinuation of

epilepsy treatment resulting in seizure recurrence: a study in an urban epilepsy clinic in India. Seizure 2007;16:601-607.

10. Chisholm D on behalf of WHO-CHOICE. Cost-effectiveness of first-line antiepileptic drug treatments in the developing world: a population-level analysis. Epilepsia 2005;46:751-759.
11. McLin, W.M & de Boer, H.M. Public perception about epilepsy. Epilepsia 1995;36:957-959.
12. Mac, T. L. et al. Epidemiology, aetiology and clinical management of epilepsy in Asia: a systematic review. Lancet Neurol 2007;6:533-543.
13. Radhakrishnan, K. et al. Prevalence, knowledge, attitude, and practice of epilepsy in Kerala, south India. Epilepsia 2000;41:1027-1035.
14. Fong C.G & Hung, A. public awareness, attitude and understanding of epilepsy in Hong Kong special administrative region, China. Epilepsia 2002;43:311-316.
15. Pandian, J.D., Santosh, D.,Kumar, T.S., Sarma, P.S & Radhakrishnan, K. High School students' knowledge, attitude, and practices with respect to epilepsy in Kerala, southern India. Epilepsy Behav. 2006;9:492-497.
16. Radhakrishnan K, Nayak SD, Kumar SP and Sarma PS. Profile of antiepileptic pharmacotherapy in a tertiary referral center in South India: a pharmacoepidemiological and pharmacoeconomic study. Epilepsia 1999;40:179-185.
17. Ronen GM, Streiner DL, Rosenbaum P. Health-related quality of life in childhood epilepsy: Moving beyond control with minimal adverse effects. Health Qual Life Outcomes. 2003;1:36.
18. Baker GA, Jacoby A, Buck D, Stalgis C, Monnet D. Quality of life of people with epilepsy: A European study. Epilepsia. 1997;38:353–62.
19. Whitman S, Hermann B. Oxford: Oxford University Press; 1986. Psychopathology in epilepsy: Social dimensions.
20. Austin JK, Shafer PO, Deering JB. Epilepsy familiarity, knowledge, and perceptions of stigma: Report from a survey of adolescents in the general population. Epilepsy Behav. 2002;3:368–75.
21. Gambhir SK, Kumar V, Singhi PD, Goel RC. Public awareness, understanding and attitudes toward epilepsy. Indian J Med Res. 1995;102:34–8.
22. Chung MY, Chang YC, Lai YH, Lai CW. Survey of public awareness, understanding, and attitudes toward epilepsy in Taiwan. Epilepsia. 1995;36:488–

93.

23. Shetty PH, Naik RK, Saroja AO, and Punith K. Quality of life in patients with epilepsy in India. J Neurosci Rural Pract 2011;2:33-38.
24. Buelow JM, Smith MC. Medication management by the person with epilepsy: perception versus reality", Epilepsy Behav 2004;5:401-406.
25. Buck D, Jacoby A, Baker GA, Chadwick DW. "Factors influencing compliance with anti epileptic drug regimes." Seizure 1997;6:87-93.
26. Peterson GM, McLean S, Millingen KS. "Determinants of patient compliance with anticonvulsant therapy", Epilepsia 1982;23:607-613.
27. Schneider J, Conrad P. Having epilepsy: the control of illness. Temple University Press. 1983.
28. Ramsey R. Treatment for Status Epilepsies. Epilepsia1983;34:S71-S81.
29. Peterson GM, McLean S, Millingen KS. A randomized trial of strategies to improve patient compliance with anticonvulsant therapy. Epilepsia 1984;25:412-417.
30. Wannamaker BB, Morton WA Jr, Gross AJ, Saunders S. Improvement in anti-epileptic drug levels following reduction of intervals between clinic visits. Epilepsia 1980;21:155-162.
31. Cramer JA. Effects of partial compliance on cardiovascular medication effectiveness. Heart 2002;88:203-206.
32. Steiner JF, Koepsell TD, Fihn SD, Inui TS. A general method of compliance assessment using centralized pharmacy records. Description and validation. Med Care 1988;26:814-823.
33. Dilorio C, Fatherty B, Manteuffel B. Cognitive-perceptual factors associated with anti-epileptic medication compliance. Res Nurs Health 1991;14:329-338.
34. Dougthy J, Baker GA, Jacoby A, Lavaud V. Compliance and satisfaction with switching from an immediate release formulation of valproate in people with epilepsy. Epilepsy Behav 2003;4:710-716.
35. Tuberculosis control – India. New Delhi, India. Directorate general of health services, 2002.
36. Khatri G.R, Thomas R. Frieden. Controlling tuberculosis in India. N Engl J Med 2002;347:1420-1425.
37. Henderson R.H and Sundaresan T. Cluster sampling to assess immunization coverage: a review of experience with a simplified sampling method. Bulletin of

the World Health Organization 1982;60(2): 253-260.

38. Cochran W.C. Sampling techniques. New York, Wiley, 1963.

39. Global Campaign Against Epilepsy. http://www.who.int/mental_health/management/globalepilepsycampaign/en/index.html

40. Watts AE. A model for managing epilepsy in a rural community in Africa. British Medical Journal 1989;298:805-807.

41. Feksi AT et al. Comprehensive primary health care anti-epileptic drug treatment programme in rural and semi-urban Kenya. Lancet 1991;337:406-409.

42. Pal DK, Das T, Sengupta S. Comparison of key informant and survey methods for ascertainment of childhood epilepsy in West Bengal, India.International Journal of Epidemiology 1998;27:672-676.

43. Gourie-Devi M, Satishchandra P, Gururaj G. Report of national workshop on public health aspects of epilepsy for senior health personnel of state health departments in India. Annals of Indian Academy of Neurology 1999;2:43-48.

44. Epilepsy management at primary health level: protocol for a demonstration project in the

People's Republic of China. Geneva, World Health Organization, 2000 (unpublished document WHO/MSD/MBD/00.11)

5. Preliminary work already done by the Investigator on this problem, e.g. selection of subjects, standardization of methods, with results, if any.

The following preliminary work has been undertaken towards implementation of the proposed study project:

Extensive discussion and planning between study team members (epidemiologists and neurologists) have been undertaken regarding study location, logistics, site-visits and personnel and equipment requirements. The project proposal is a direct outcome of these discussions.

A pilot community survey of epilepsy has been conducted at Jamalpur, the urban health center attached to Dayanand Medical College, Ludhiana. A population sample of 15,750 individuals was surveyed with the help of trained field workers. The

screening questionnaire proposed to be used in this study was validated and then used for this survey.

5.1 One hundred and fourteen people with confirmed active epilepsy and 114 controls were enrolled from this survey. Crude prevalence of active epilepsy was 7.2/1000. Serological evaluation found that prevalence of antibodies to *Taenia solium* was 25.5% in people with active epilepsy and was significantly higher than the prevalence in controls (12.3%). Conditional fixed-effects logistic regression analysis, adjusted for baseline parameters for which $p<0.1$ in the univariate analysis (house ownership, number of rooms, drinking water facility, non-vegetarian food consumption and feeding of stray dogs), estimated an adjusted odds ratio of 2.8 (95% Confidence Interval [CI] 1.2 to 6.8, $p=0.02$) for seropositive status for *T. solium.*

5.2 A monthly epilepsy clinic is held at Urban Health Center of Dayanand Medical College, located at Jamalpur for these identified cases of active epilepsy. The patients are telephonically contacted in advance to remind them about their monthly follow up and their response is recorded. They are provided free AEDs as per availability. It was observed that about 47 patients were on regular follow up and the remaining 67 patients were not attending the epilepsy clinic.

A study was conducted to review the current status of treatment of the patients who were not attending the epilepsy clinic. The latter were visited at their home and interviewed by a neuropsychologist along with a field worker. It was found that out of these 67 patients, 15 (22.4%) patients were taking anti- epileptic medicines from local physicians, 20 (29.9%) patients had migrated, 7 (10.4%) patients were off treatment (they did not require treatment), 24 (35.8%) were not taking AEDs despite the fact that they required intake of AEDs in the opinion of the neurologist and one (1.5%) patient had expired. This group constituted the treatment gap group.

They were further interviewed for reasons contributing to primary and secondary treatment gaps. It was found that out of these 24 patients, there were seven (29.2%) who never took any AED treatment (primary treatment gap) and 17 (70.8%) with those who left treatment after initially starting treatment (secondary treatment gap).

The reasons for the treatment gap included:

i) Inadequate knowledge about appropriate treatment

ii) indirect cost incurred by the patients in the form of absence from work to

attend the epilepsy clinic

iii) dissatisfaction with the treatment because of recurrent seizures despite AEDs

iv) lack of information about the consequences of medication non-adherence

v) belief in faith healers advice

vi) substance abuse

vii) Co-morbidity, mental retardation and psychosis

viii) Social stigma

The study was done after running more than one year of free epilepsy clinic in the community. A comparison of the results obtained during this review study and at the beginning of the study revealed that the primary treatment gap reduced from 25.4% to 7.5%.

It was also observed that in the beginning of the study, 52% patients were taking AEDs, whereas after running more than one year of epilepsy clinic, 62% patients were on regular AEDs. This shows that free AEDs and monthly epilepsy clinic resulted in only a slight increase in the number of patients with active epilepsy who were taking AEDs regularly. Hence better methods of provision of care and steps to reduce treatment gap are desirable.

5.3 The sample size for the study has been calculated (vide infra).

6.0. Links with other ICMR projects (ad-hoc, task force or collaborative):

Association between *Toxocara canis* infection and epilepsy: A collaborative, twin (Community prevalence and hospital based incidence) case-control study.

Project No. 5/4-5/19/Neuro/2008-NCD-I

7.0. List of important publications of last 5 years of the all the investigators in the relevant fields (enclose reprints, if available)

Gagandeep Singh

1. **Singh G**, Bawa J, Chinna D, Chaudhary A, Saggar K, Modi M and Sander JW. Association Between Epilepsy Cysticercosis and Toxocariasis: A Population-Based Case-Control Study in a slum in India 2012 (Submitted to Epilepsia) (Annexure-VIII).
2. **Singh G**, Prabhkar S. The association between central nervous system (CNS) infections and epilepsy. Epidemiological approaches and microbiological and epileptological perspectives. Epilepsia 2008; 49 (suppl 6): 2-7
3. **Singh G**, Prabhkar S. The effects of antimicrobial and antiepileptic treatment on the outcome of epilepsy association with central nervous system (CNS) infections. Epilepsia 2008; 49: (Suppl 6):42-46.
4. **Singh G**. Other central nervous system infections and status epilepticus. Epilepsia. 2009; 50 (suppl)12:67-9.
5. Burneo JG, Del Brutto O, Delgado-Escueta AV, Gonzalez AE, Medina MT, Montano SM, Moyano LM, Nash T, Roman G, **Singh G**, White AC Jr, Wiebe S, Garcia HH. Workshop report: Developing an international collaborative research network in neurocysticercosis and epilepsy. Epilepsia. 2009 May; 50 (5): 1289-90.
6. **Singh G,** Rajshekhar V, Murthy JM, Prabhakar S, Modi M, Khandelwal N, Garcia HH. A diagnostic and therapeutic scheme for a solitary cysticercus granuloma. Neurology. 2010; 75 : 2236-45.
7. **Singh G.** Do no harm –but first we need to know more: the case of adverse drug reactions with antiepileptic drugs. Neurology India . 2011 Jan-Feb; 59(1):53-8.
8. **Singh G.** Management of medical co-morbidity associated with epilepsy. Shorvon S, Perucca E, Engel J. Jr. The treatment of epilepsy 3rd Edition, PP 268-279. Philadelphia, Wiley-Blackwell, 2009.
9. Modi M, **Singh G.** Other parasitic diseases. In: Shorvon S, Andermann F, Guerrini R. The causes of epilepsy. Cambridge University Press. 2011: 501-510.
10. **Singh G.** Murthy JMK, Radhakrishnan, A. Epilepsies due to trauma, stroke, tumour and infections. In: Oxford Textbook of Clinical Neurology Series: Epilepsy. Oxford University Press, Oxford.

8.0. Detailed research plan

The overall objective of this study is to determine the optimal method of provision of care to people with epilepsy ensuring safe and effective treatment of epilepsy in the community. This will involve comparison of the impact of an interventional package involving the home provision of AEDs, education and advice on coping with epilepsy and compliance monitoring on long-term seizure control, quality of life, and drug adherence in comparison to routine clinic-based care.

8.1 Study area and Population

Ludhiana is a densely populated industrial district in the Punjab State in North India with a population of approximately 3.2 million. We will adopt the 30-cluster sampling approach to select the study population. A population of 60,000 will be surveyed; approximately 75% of the study population (45,000) will be selected from urban and 25% (15,000) from rural area. For the rural community, the population will be chosen from Malaud Block in Ludhiana District (population: 85, 789; males: 48, 479 females: 38, 786) comprising villages 76 villages (Fig. 2). The urban population will be selected from Ward nos. 12 & 13 in Zone B in Ludhiana City (population: 54, 236; males: 29,989 females: 24,247) (Fig. 3). All these communities lie partly within the field practice area of the Department of Social and Preventive Medicine, Dayanand Medical College, Ludhiana.

Thirty clusters of an average size of 2000 people will be selected with probability proportional to the lines suggested by the World Health Organization (WHO) for assessment of vaccine coverage. Within each cluster a starting household will be randomly selected. Selection would begin in the starting household and then continue to the next nearest household until a total of 2000 individuals are obtained. All individuals in the last household falling into the sample are included, even if that means including few more individuals in the cluster rather than the required minimum number of 2000.

Each field practice area is under a health center located in the community, run by the Department of Social and Preventive Medicine, at Dayanand Medical College and Hospital. Each health center is under a qualified medical officer and several ANMs. The health care workers make daily visits to houses in their assigned area, visiting each house about once in six weeks. They maintain a record of births, death, entry,

embarkations and morbidity in each house in the past six weeks and offer ordinary health-related advice especially to children and expecting mothers. Mobile clinics and many vaccination campaigns are also taken up on a regular basis by the ANMs. Residents visit the health centre for common complaints where they are attended by the medical officer and the assisting staff. They are also provided with medicines on nominal charges. Should a resident report to the center with a serious ailment, they are transported by an ambulance to the medical school hospital.

The proposed urban study sites under these health centers lie on the outskirts of Ludhiana and constitute the slum area of the city. The population comprises of both ethnic Punjabi natives and migrant laborers from other states within India. Inhabitants in these areas are generally daily wagers, engaged as unskilled or semiskilled workers.

The survey will be conducted on the populations who have been residents of the area from the last five years to exclude transitionary migrants. It will cease once we achieve a target of 600 People with Epilepsy (PWE).

8.2 Pre-Screening and Study Assessment and Training

Three tiers of study-related training will be provided:

8.2.1. Two field workers will be especially recruited for conducting the survey at the beginning of the study. A detailed training program will be conducted which will last for almost a month. The aim of the training program will be to equip the field workers with the capability to administer an epilepsy questionnaire, and to provide elementary counseling in relation to epilepsy in order to optimally convince the subjects to participate in the study and to administer the outcome assessment tools (see below). A post-test will be conducted for theoretical and practical assessment.

8.2.2. Two medical practioners routinely employed by the medical college to work in the urban and rural primary health centres under the Department of Social and Preventive Medicine with the provided training in Epilepsy Care. The Guideline developed by the Indian Epilepsy Society for General Practitioners (GEMIND: Guidelines for Epilepsy management in India) will be used for this propose.

8.2.3. The ANMs involved in the study will be trained to provide counseling and basic education in dealing with epilepsy and its medical, social, personal and occupational problems, recording seizure control, details about the study medications and maintaining seizure diaries.

8.3 Development and Validation of Screening Tool

The screening questionnaire has been adapted from previous epidemiological studies for epilepsy in Bangalore, India, Ecuador and China (1,2,3) (Annexure-II). It includes demographic components adapted from the Sicilian neuroepidemiological study (4). Socio-economic status of the family will be recorded on modified Udai Pareek Scale (5) (Annexure-IV). Besides another structured questionnaire, for the risk factors for epilepsy will be administered to the survey subjects (Annexure-III). The questionnaire will be translated into Hindi and Punjabi language and will be administered in the same language.

The screening questionnaire was validated in 142 persons, consisting of patients with epilepsy and patients with other neurological problems, attending the Neurology outpatient clinic of Dayanand Medical College. Responses to the screening questionnaire were referenced to epileptological assessments, made by a Consultant Neurologist with special training and expertise in epilepsy. The assessment was based on interview and examination
and review of available investigations. Based on observations, the sensitivity of the screening questionnaires was found to be 0.83, specificity 0.84, positive predictive value 0.526 and negative predictive value 0.96.
The screening tool will be administered by the two field workers.

8.4 Screening Survey

The screening survey for epilepsy will be conducted in the community following the 30-cluster sampling technique, by the two trained field workers using the validated screening questionnaire. The field workers will conduct the survey under the guidance of Auxiliary
Nurse Midwives (ANM's). The ANM's are familiar with the area and the resident families. To ensure that this knowledge does not bias the screening procedure, the ANM's will be guided not to disclose this information to the field workers. Participation of the ANM's is deemed as useful because of their previously established relationship with the family. However, their role in the survey will be introductory only.

The ANM's will only guide and introduce the field workers in the survey process. The questionnaire will be administered by the field workers independently,

to all people in the house. For children less than 12 years of age, the questionnaire will be administrated to an older person in the family, usually the mother. Individuals unavailable at the time of survey will be screened by revisiting later by fixing a suitable time through the available family members in the house.

8.4.1 Spatial analysis of occurrence of epilepsy

8.4.1.1 Background

Both human activities and factors causing disease spread geographically. Most of the pathogenic factors are universally epidemic and do not belong to a special region or area, while some of them just occur in the specific regions. Usually, concentration of a disease in particular areas statistically indicates the unusual presence of some factors that cause the disease. Moreover, the co-occurrence of such factors in an area increases the happenings of the disease dramatically. Such correlations make it necessary to study and compare the spatial distribution and pattern of both the diseases and their causes. Besides time and person, knowledge of the spatial distribution of disease cases is essential in understanding the disease transmission and determinates. Geographical information system (GIS) can be used to analyze and compare such patterns. The integrative features of GIS are helpful in summarizing the complex relationships among disease causes, the environment, and human populations.

8.4.1.2 Method

The following methodology will be used for spatial analysis of occurrence of the epilepsy:

1. The administrative boundaries of the study area will be identified and demarcated using high resolution satellite data available with Punjab Remote Sensing Centre, Ludhiana
2. The disease incidence data will be collected during the survey and the location of surveyed houses will be demarcated using android devices/GPS enabled cameras.
3. Socio-economic, family details, occupational patterns, awareness and knowledge about epilepsy, and other data of each house hold will be collected from a questionnaire survey.

4. The relationship among the incidence of disease, socio-economic data, family details, occupational patterns, awareness and knowledge about epilepsy, and other data will be analyzed in the GIS environment.

8.5 Diagnosis and Neurological Assessment

All individuals who will be screened positive during the screening survey will be transported on appointed days to the health centre. An experienced neurologist in the study team will evaluate them. A comprehensive interview will be conducted to take detailed medical history from the subject and accompanying person who has witnessed the seizures. The identified cases with active epilepsy will be subjected to detailed clinical epileptological assessments and sleep and awake EEGs at Dayanand Medical College & Hospital.

8.6. Sample size

We will use a cluster randomization technique for randomizing subjects to either the interventional or the control arms. For calculation of sample size, we have assumed an ICC of 0.05. Using an ICC of 0.05, at power of 80% and a 5% two-sided significance, the estimated sample size is 24 clusters of 10 subjects each or 20 clusters of 15 subjects each. The cluster technique for screening the population in blocks of 2000 each will perhaps yield 15-20 people with epilepsy per block (assuming an epilepsy prevalence of 5-10/1000 population. Further assuming that about 5 out of these 15-20 people with epilepsy will not consent to participate in the trial, we will have about 10 people with epilepsy who will be available for cluster randomization. Therefore, the same blocks that are used for screening will be utilized for cluster randomization in the trial. Hence the 30 blocks used for screening will itself be the unit of cluster randomization and this will yield a sample size of 600 people with epilepsy.

8.7. Randomization

A cluster randomization technique will be used for the interventional study. As explained above, 30 clusters of the base population screened will yield 30 clusters of 10 people with epilepsy per cluster. The randomization code with be generated by the Randomization Officer (SS). The Randomization Officer will not be involved in

outcome assessments.

8.8. Interventional package

The interventional package will comprise of home-based, health-worker-guided provision of AEDs, education and compliance monitoring. The 3 essential components of the interventional package are delivery of AEDs, provision of education and counseling regarding how to deal with epilepsy and monitoring of compliance. The interventional package will be delivered by the ANMs. They will undertake home visits on a two-weekly basis. During these home visits, they will undertake the following:

i) On the first visit, they will explain the purpose of their visits, record informed consent, convey the frequency of their visits, agree upon the appropriate time and day of the visits and clearly enumerate the antiepileptic medications, the dose and frequency that they would be dispensing.
ii) In addition to dispensing the medications, they would also provide the subjects with drug dispensers and seizure diaries on the first visit (Annexure XV).
iii) They will attempt to have a general but comprehensive discussion about medical, social and occupational aspects of epilepsy to the extent that the subject desires.
iv) During each two-weekly visit, the field workers will enquire about the general health of the subjects.
v) During the two-weekly visit, they will also enquire and record seizure control; If seizures recurred in the two weeks prior to the visit, this will be recorded in purpose-made seizure diaries, a copy of which will also be provided to the subject/family.
vi) Medication provision will also be made during the two-weekly visits.
vii) Finally any additional counseling and education in relation to epilepsy will also be provided in the two-weekly visit.

In this way, approximately 70 visits in 18 months of follow-up period will be made to each patient's house. They will be provided with a help-line number which will be accessible in the morning hours. The two-weekly record made will be reviewed in monthly meetings by the Study Neurologist. The Study Neurologist will make

appropriate changes in the treatment plan and if necessary schedule a neurological consultation for reviewing the treatment plan. The changed treatment plan will be conveyed to the field worker for necessary action.

8.9. Control Arm: Routine clinic-based care

In comparison to the study arm receiving the interventional package, people with epilepsy in this arm will be invited to attend a monthly epilepsy clinic for follow-up at the nearest health centre and will be seen by a physician (MD Medicine). The physician will be of a level of a General Practitioner who has undergone a short intensive course in epilepsy management. A reminder system for both appointment and medication refills will be followed. They will be provided with AED's free of charge. Special drug dispensers will be provided to patients to improve adherence and maintenance of AED intake record (pill counts; see below). Besides, they will be explained about their disease, the necessity of treatment and adherence. A monthly record of these patients will be maintained by the site, regarding their drug adherence, control of seizures and improvement in health status. They will be provided with a help-line number which will be accessible in the morning hours. The study neurologist will review this monthly record and suggest treatment changes or consultation review, if required to the General Practitioner.

8.10. Outcome Assessment

The outcome assessment will be undertaken by the field workers and a study team member other than the Study Neurologist. This will be done in a blinded manner to prevent bias. The questionnaire will be filled by the subject and different aspects such as seizure worry, overall quality of life, emotional well being cognitive performance, medication effects and social function will be assessed by independent investigation.

The outcome assessment will include:

8.10.1 Quality of life (QOL) Assessment

To assess the QOL in people with epilepsy and to evaluate various factors affecting the QOL in them, QOLIE-31 (Annexure- XIII) questionnaire will be filled by all adults, who are 18 years or older themselves at the time of enrolment in the study, then in the middle and later it will again be administered at the end of the study (6).

Adolescents (ages 11-17 years) will complete QOLIE-AD-48 designed for that age group (Annexure- XIV) in the beginning, middle and at the end of the study(7). Subjects of age 10 years and below will not be assessed for quality of life. The questionnaires will be translated to Punjabi and Hindi, the two languages used by the inhabitants. The same will be back translated and validated by testing the questionnaire in a pilot study. The questionnaire will then be administered to the study subjects.

QOLIE-31 (6) has one visual analogue scale of overall quality of life and 30 questions pertaining to diverse aspects of QOL. Different aspects studied in QOLIE-31 scale are as follows: Seizure worry, Overall quality of life, Emotional well-being, Energy or Fatigue, Cognitive performance, Medication effects and Social function. QOLIE-31 overall score is calculated by weighing and summing individual QOLIE-31 scale scores. A lower score indicates poor quality of life and higher score indicates better quality of life.

QOLIE-AD-48 (7) comprises of 48 questions about health and daily activities. The first part has questions about general health and the second part about the effects of epilepsy and antiepileptic medications.

Towards the end of the study, QOLIE-31 questionnaire (for 18 years and above) and QOLIE-AD-48 (for adolescents 11-17 years) will be filled by the participating subjects to assess the QOL in people with epilepsy and to evaluate various factors affecting the QOL in them and the impact of the program followed in the twos interventional groups.

This assessment will be helpful in determining the best possible and effective treatment option for epilepsy patients in the community.

8.10.2. Assessment of seizure control

All subjects will be provided with a seizure diary (Annexure – XV) and will be asked to record seizures on it. Seizure diaries will be evaluated on clinic visits of patients (control arm) or when they are visited at their houses by the ANMs (interventional arm).

8.10.3. Evaluation of drug adherence:

Several different tools will be used for evaluation of drug adherence:

8.10.3.1. Self reporting non-adherence: All patients will be administered a Self-reporting medication-taking scale (Morisky et al., 1986) - Annexure-IX. Field workers will be trained to interview the patients as the relationship and manner of communication between them and the subject would significantly affect adherence. This scale helps to record drug errors of omission in patients due to forgetting, carelessness, stopping the drug when feeling better or starting the drug when feeling worse. This questionnaire will be administered once a month.

8.10.3.2.Brief Medication Questionnaire: A self-administered adherence specific instrument called the Brief Medication Questionnaire (BMQ) will be used (Svarstad et al., 1999) - Annexure- XII. The instrument has three sets of questions: 5 regimen screen items; 2 belief screen items and 2 recall screen items. By incorporating three domains, the instrument questions the patient on medication taken during the past week, perceived efficacy and bothersome features and potential difficulties in remembering doses for each medication. Adherence measures will be categorized as:

"Repeat non-adherence" if patients take >=20% over or under the desired regimen,

"Sporadic non-adherence" if patients take 1% to 19% over or under the desired regimen, and

"No non-adherence" if patients take 100% of the desired regimen.

This tool helps to screen adherence and barriers to adherence. It includes a 5-item Regimen Screen that asks patients how they took each medication in the past week, a 2-item Belief Screen that asks about drug effects and bothersome features, and a 2-item Recall screen about potential difficulties remembering. This questionnaire will be administered once a month.

8.10.3.3. Modified Kilifi epilepsy belief and attitude scale (Mbuba et al., 2012) - Annexure- X. This scale is a reliable and valid tool that measures beliefs and attitudes about epilepsy. It also assesses the effectiveness of interventions to improve knowledge, beliefs and attitudes about epilepsy. This scale has five subscales on causes of epilepsy, biomedical treatment, cultural treatment risks & safety concerns and negative attitudes. This questionnaire will be administered at the beginning and then at the end of the study.

8.10.3.4. TSQM (Version II): Treatment Satisfaction Questionnaire for Medication (Atkinson et al., 2005) Annexure- XI. This 11 question questionnaire measures treatment satisfaction with medication. TSQM version 2 helps to predict treatment dosing adherence and medication persistence over time. This questionnaire will be administered once in three months.

8.10.3.5. Epilepsy self-management questionnaire (DiIorio and Henry, 1995) – Annexure XVI. The Epilepsy Self-Management Scale (ESMS) is a 38 item scale that assesses frequency of use of epilepsy self-management practices. Each item is rated on a 5-point scale ranging from 1, never, to 5, always. The 26 original items were categorized into three areas: a) medication-related, b) safety-related, and c) general lifestyle management. Total scores are found by reverse coding the 12 negatively worded items and summing responses to all 38 individual items. Total possible scores range from 38-190 with higher scores indicating more frequent use of self-management strategies. This questionnaire will be administered in the beginning, midway and then at the end of the study.

8.10.3.6. Pill counts: Pill count is counting the number of dosage units (e.g., tablets, capsules) that the patient has not taken by the scheduled appointment or clinic visit. The returned dosage units will be counted and compared with the number of units received by the patient in the most recent prescription and the length of time since the medication was dispensed. Medication regimen adherence will be calculated by subtracting the number of units returned from the number of units issued. This will provide the amount of medication used by the patient during that time period. The amount used will be divided by the expected amount and multiplied by 100 to determine the percentage of adherence.

Care will be taken-

- to include all medication refills in the calculation.
- exact date of the refill will be recorded.
- patients will be told to bring all of the medication they have not consumed, including those in the pill boxes and other containers.

8.11. Time periods of various assessments during follow-up

1. QOLIE-31 and QOLIE-48 - Beginning, midway and end of the study.

2. Epilepsy self management scale - Beginning, midway and end of the study.
3. Modified Kilifi epilepsy belief and attitude scale – Beginning and end of the study.
4. Brief medication questionnaire – once a month.
5. Self reported medication taking scale – once a month.
6. TSQM (version 2): Treatment satisfaction questionnaire for medication – once in three months.
7. Pill counts – Monthly in the first arm and weekly in the second arm.

8.12. Data Management and Analysis

Data will be double-entered and validated using Stata, version 9. Prevalence estimates will be calculated with confidence intervals. A descriptive analysis of cases of active epilepsy will be presented. Outcome measures seizure control, quality of life and adherence for the three interventional arms will be assessed at the end of the study.

8.13. Protocol for Field workers:

1. Undergo training in the two month so that they are equipped with the ability to administer the epilepsy questionnaire, and to provide counselling in relation to epilepsy.

1. They will conduct the screening survey following the 30-cluster sampling technique for epilepsy in the community and administer the screening and other structured questionnaires.

3. Parallel to this they will fix appointments for all screened patients for their neurological assessment and make all required arrangements for the patient's visit, transportation and investigations. The field workers will be present during the patient's interview with the study neurologist.
4. Field workers will also help in the conduction of the monthly epilepsy clinic in the community. They will make telephone calls to remind all patients of the first arm to attend the clinic. They will help to dispense the patients one month's AEDs and record pill counts of the previous month.

5. For the second arm the field workers will monitor weekly visit to the patient's houses, dispense AEDs, record adherence, side effects and response to treatment.

6. They will administer QOLIE-31 (for 18 years and older patients) and QOLIE-48 (for ages 11-17 years) at the time of patient's enrolment in the study, in the middle and in the end of the study.
7. They will administer the following questionnaires:

i) Epilepsy self management scale (Annexure XVI)- Beginning, midway and end of the study.

ii) Modified Kilifi epilepsy belief and attitude scale (Annexure- X)– Beginning and end of the study.

iii) Brief medication questionnaire (Annexure- XII) – once a month.

iv) Self reported medication taking scale (Annexure-IX) – once a month.

v) TSQM (version 2): Treatment satisfaction questionnaire for medication (Annexure-XI) – once in three months.

8.14. Economic evaluation

Economic evaluation of the two alternative strategies is an important component of the study proposal. It will be undertaken at the PHFI, Gurgaon with the help of Collaborators (Dr. Krishna D. Rao and Dr. Susmita Chatterjee). Cost-effectiveness analysis is one form of full economic evaluation where both the costs and consequences of health programmes or treatments are examined. This type of economic evaluation helps policy makers in allocating scarce resources for different programmes in a resource poor country like India.

The objective of the economics study is to evaluate the cost-effectiveness of the two different delivery of care for the PWE, i.e. home-based health-worker guided anti-epileptic drug (AED) provision and health education and routine clinic-based care for people with epilepsy as well as the cost benefit of the former intervention. Hence the economic evaluation has two components:

8.14.1. Cost Effectiveness Analysis

Effectiveness data will be sourced from the trial itself. Cost-effectiveness ratios will be presented in terms of cost divided by proportion of people with epilepsy in remission at the end of the follow-up period in the two arms of the study.

Cost Effectiveness = Cost of the health care intervention / Measure of effectiveness (Proportion of subjects recruited who remian seizure free till the end of follow-up).

8.14.2. Cost Benefit Analysis

Cost benefit of the home-based intervention will be calculated as follows:

Cost Benefit: Costs involved in home-based care intervention / Cost involved in routine clinic-based care.

8.14.3. General Methods

The analysis will be based on a government perspective and a societal perspective. The analytic horizon (period over which costs and effects are measured) will be for the trial period. The cost items will include service delivery costs as well as patient cost. A structured questionnaire will be prepared for collecting all costs related to service delivery and patient cost. Service delivery cost will include training, time cost of service providers etc. Patient cost will include treatment cost as well as time costs of patients, accompanied persons, informal caregivers. Human capital approach will be used for calculating these costs. Here, the number of productive days lost per month will be estimated in each arm and be multiplied with the daily minimum wage for an Indian worker (Rs. 240/day) (http://www.paycheck.in/main/salary/minimumwages/punjab).

The ratio of the productivity lost in each arm will then be calculated.

8.14.4. Time frame

The economic evaluation will take about 10 months spread throughout the trial period. Persons involved in economics study

Krishna D Rao – 10% time for 10 months spread throughout the study period Susmita Chatterjee – 20% time for 10 months spread throughout the study period Research Assistant – 50% time for 10 months spread throughout the study period.

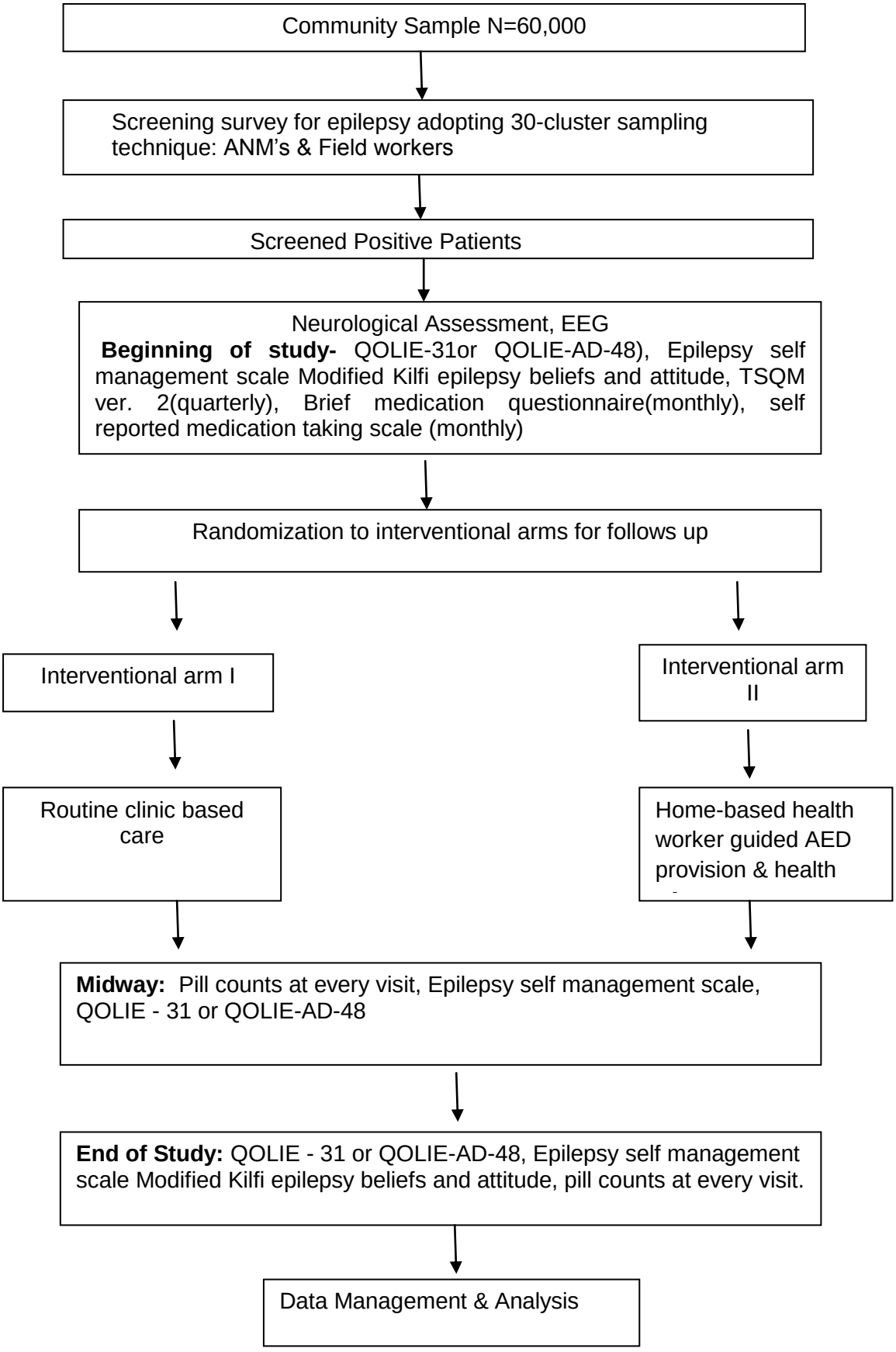
8.15. References

1. Gourie-Devi M, Gururaj G, Satishchandra P, Subbakridhan DK (2004). Prevalence of neurological disorders in Bangalore, India: a community based study with a comparison between urban and rural area. Neuroepidemiology 2004;

23:261-268.

2. Placencia M, Sander JW, Shorvon SD, Ellision RH, Cascante SM. Validation of a screening questionnaire for the detection of epileptic seizures in epidemiological studies. Brain 1992;115:783-794.
3. Ding D, Wang W, Wu J, Ma G, Dai X, Yang B, Wang T, Yuan C, Hong Z, Hanneke M de Boer, Prilipko L, Sander JW . Premature mortality in people with epilepsy in rural China: a prospective study. Lancet Neurol 2006;5:823-827.
4. Meneghini F, Rocca WA, Grigoletto F, Morgante L, Reggio A, Savettieri G, Di Perri R, Anderson DW .Door-to-door prevalence survey of neurological diseases in a Sicilian population. Neuroepidemiology 1991;10:70-85.
5. Pareek U, Trivedi G (1979). Manual of socioeconomic status scale. Manasyan Publishers, Delhi, India.
6. Cramer JA, Perrine K, Devinsky O, Bryant-Comstock L, Meador K, Hermann B. Development and cross cultural translations of a 31 item quality of life in epilepsy inventory. Epilepsia 1998;39:81-8.
7. Cramer JA, Westbrook L, Devinsky O, et al. Development of the QOL in epilepsy Inventory for Adolescents: The QOLIE-AD-48. Epilepsia 1999;40:1114-1121.
8. Svarstad BL, Chewning BA, et al. The brief medication questionnaire: A tool for screening patient adherence and barriers to adherence. Patient Education and counseling 1999;37:113-124.
9. Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. Medical Care 1986;24:67-74.
10. Mbuba CK, Abubakar A, et al. Development and validation of the Kilifi Epilepsy Beliefs and Attitude Scale. Epilepsy and Behavior 2012;24:480-487.
11. Atkinson MJ, Kumar R, et al. Hierarchical construct validity of the treatment satisfaction questionnaire for medication (TSQM version II) among outpatient pharmacy consumers.

8.17. Study Flowchart



8.18. Time Table for Study Project

Aspect	Months	Milestone
Community survey	0-1 month	Setting up study; Recruitment of social workers and research fellows
	1-2 months	Training of health and social worker recruits
	2-12 months	Screening survey
Neurological assessment	6-12 months	Neurological assessments, EEG, Imaging, Epilepsy syndrome classification
Follow-up	12-30 months	Randomization & follow-up of PWE
	Beginning	QOLIE-31or QOLIE-AD-48), Epilepsy self management scale Modified Kilfi epilepsy beliefs and attitude, TSQM ver. 2 (quarterly), Brief medication questionnaire (monthly), self reported medication taking scale (monthly), pill counts at every visit.
	Midway	Pill counts at every visit, Epilepsy self management scale, QOLIE - 31 or QOLIE-AD-48
	End	QOLIE - 31 or QOLIE-AD-48, Epilepsy self management scale Modified Kilfi epilepsy beliefs and attitude, pill counts at every visit
Study analysis	3-30 months	Data entry
	30-33 months	Data analysis, statistical processing
	33-36 months	Discussion, outcome planning and presentation of study results

9.0. Facilities in terms of equipment, etc, available at the sponsoring institution for the proposed investigation.

9.1. Equipment

Statistical software (Stata version 9 & 12 available) for data analysis

Software facilities for writing up data (EndNote Ver. 5.0)

9.2. Personnel Support

Administrative support for recruitment of study personnel

Technical personnel for performance of EEG studies

Personnel support for organization of field studies

Health workers already employed by Social and Preventive Medicine Departments (to accompany study recruits for the screening survey)

9.3. Infrastructure facilities

Library facility

Space for laboratory-based studies

Office space for study, storage of study material.

Office space for clinic assessments and EEG

Air-conditioning

Electricity and water supply

10.0. Budget requirements (with detailed break-up and full justification):

10.1. Staff

Staff		1st year	2nd year	3rd year
Field Workers		2	2	2
Salary @ Rs. 15,080/- each		Rs. 3, 61,920	Rs. 3, 61, 920	Rs. 3, 61,920
SRF (One)				
Salary @ Rs. 28,000pm		Rs. 3, 36,000	Rs. 3, 36,000	Rs. 3, 36,000
Total Salary		Rs. 6, 97, 920	Rs. 6, 97, 920	Rs. 6, 97, 920

Total: Rs. 20, 93, 760

10.1.1. Justification: At present, the department of social and preventive medicine does not have personnel support to provide the extra input required for this study. The field workers will perform phase one of the study. We plan to recruit two field workers for a period of three year. The first month will be spent in training the field workers. To screen a population of 60,000 we assume that one person will be able to screen a population of 75-80 daily. Further assuming that, there will be about 25 visits every month, each worker would be able to screen a population of 30,000 over 15 months giving a total population screened as 60,000.

The senior research fellow (SRF) will assist in the co-ordination and planning of the community survey. The SRF will organize the follow-up of people with epilepsy – a monthly epilepsy clinic in the community, visits to patient's houses for home based treatment and health education. Further, the SRF will organize timely purchase of AEDs, in addition to administrative responsibilities.

10.2. Contingencies

10.2.1. Recurring (Transport for survey and neurological assessment and conducting follow-up of pateints)

Transport in the field of workers, investigators and patients	**1st year**	**2nd year**	**3rd year**
Investigator visits 4 / month x 12 months (Rs.1200/day)	57,600/-		
Subject Transport (600 x 250)	1,50,000/-		
Field trips of study team for monthly epilepsy clinic = 12 months x Rs. 1200	14,400/-	14,400/-	14,400/-
Total	2,22,000/-	14,400/-	14,400/-
Grand total			**2, 50, 800**

10.2.1.1. Justification:

The field trips will be arranged by the department to the survey site and vehicle will be arranged for their transport. The patients screened positive after survey will be assessed by the neurologist in the field on weekly basis. Transport will also be arranged for patients coming to the hospital for investigations.

10.2.1.1Recurring (Transport for conducting follow-up of patients)

Transport in the field of workers and investigators for follow-up	**1st year**	**2nd year**	**3rd year**
Medicines for patients attending epilepsy clinic and home based treatment = 600 patients x Rs.~~2880~~1810/year (Follow-up up to 2 years)	~~17, 28, 000-~~ 10,86,000/-	~~17, 28,000-~~ 10,86,000/-	
Total	10,86,000/	10,86,000/-	

Total Recurring: Rs. 2, 50, 800 + Rs. 21, 72, 000 = **Rs.24, 22,800**

10.2.2.1. Justification:

Field trips will be arranged by the department for conducting the follow-up of patients. Vehicle will be arranged for the study team for conducting monthly epilepsy clinic in the community. Field workers will also be provided with transport facilities for home based treatment.

10.2.3. Non-recurring (equipment/consumables)

Computer + Accessories	Rs. 50,000/-
Printer + Scanner	Rs. 15,000/-
Softwares	Rs. 25,000/-
Hard disk storage device (I unit)	Rs. 10,000
Special drug dispensers = 600 patients x Rs. 250	Rs. 1,50,000
Vacutainers, Syringes, vials	Rs. 80,000
Stationery – Information Brochures, Posters	Rs. 94,000
Bicycles (Two) for Home based treatment	Rs. 10,000
Two GPS based camera/Android devices @Rs. 25000/- each	Rs. 50, 000

Total: Rs. 4, 84, 000

10.2.3.1. Justification:

A stand-alone computer is required so as to provide confidentiality and safety of the study data and patient records. A printer with scanner is required for printing patient history and data to maintain patient files. One hard disk storage device for storing the entire survey and patient data. Special medication containers have to be provided to all the patients during the follow-up to check compliance. Expenditure for stationary, vacutainers, syringes and vials is petty but nonetheless essentially required. Field workers will be provided with bicycles for visiting patients houses, for home based treatment.

Two GPS enable camera/ android devices are required for taking the location data

along with photograph of each household.

10.3. Others

Item	
Travel	Rs. 30, 000
Statistical analysis	Rs. 30, 000
Spatial analysis of data	Rs. 1, 44, 000

Total: Rs.2, 04, 000

10.3.1. <u>Justification</u>: The above amount can be broken down into two categories: expenditure required for data analysis, meeting and as travel grant in order to present this data at scientific meetings and for preparation of reports as well as outcome manuscript in peer-reviewed scientific journals as well as discussion meetings for extension research based on the outcome of this study.

In addition, we would like to recruit the services of a professional statistician who would provide us with consultancy service on the data generated and its analysis. The spatial analysis of data will be carried out by GIS Analyst under the supervision of Dr Setia and the GIS analyst will be paid according to norms of Punjab Remote Sensing Center.

10.5. Total Budget Breakdown

	1st year	2nd year	3rd year	Total
Salary	Rs. 6, 97, 920	Rs. 6, 97, 920	Rs. 6, 97, 920	Rs. 20, 93, 520
Recurring				
Field Trips/Medicines	Rs. 13, 08, 000	Rs. 11, 04, 400	Rs. 14, 400	Rs. 24, 22, 800
Non recurring				
Equipment/ consumables	Rs. 1, 50, 000	Rs. 1, 44, 000	Rs. 1, 90, 000	Rs. 4, 84, 000
Others				
Travel/ Statistical analysis		Rs. 30, 000	Rs. 1, 74, 000	Rs. 2, 04, 000
Total				Rs. 50, 60, 560
DMC&H charges @3% of total				Rs. 1, 51, 816.8
Grand Total				Rs. 52, 12, 376.8

Final Total= Rs. 52, 12, 377

ANNEXURE – I

Definitions

A list of operational definitions, which would be used in the survey are provided below. These are based on the recommendations of the Commission on Epidemiology and Prognosis of the International League Against Epilepsy and also on experience from some of the epidemiological studies that the investigators have been previously involved with.

Epileptic seizure: clinical manifestation that results from an abnormal and excessive discharge of a set of neurons in the brain.

Epilepsy: a condition characterized by recurrent unprovoked seizure

Febrile seizure: Convulsive seizure in the context of a febrile illness, other than a central nervous system infection, without a previous unprovoked seizure and after the age of 1 month but before 5 years of age.

Prevalent epilepsy: atleast 2 unprovoked seizures at the prevalent day.

Incident epilepsy: Two unprovoked seizures in the past 3 months or number of cases developing non-febrile seizures for the first time in the past 3 months.

Active epilepsy: Those persons with epilepsy, which experienced at least one seizure in the past 5 years.

Inactive epilepsy (or epilepsy in remission): a prevalent case with the last seizure > 5 years before the prevalent date with or without treatment.

Point prevalence: The point prevalence dates will correspond to the dates of administration of the questionnaire. Point prevalence will be calculated separately for active and inactive epilepsy.

Lifetime prevalence: Prevalence rates for nonfebrile seizures of all types including active and inactive epilepsy.

Incidence: Nonfebrile seizure in the past 12 months / two unprovoked seizures in the past 3 months.

Annexure II

Screening Questionnaire

1. Have you ever had attacks of shaking of the arms or legs, which you could not control?
2. Have you ever had attacks in which you fall and become pale?

Both question 1 and 2 must be affirmative to render the subject positive.

3. Have you ever lost consciousness?
4. Have you ever had attacks in which you fall with loss of consciousness?
5. Have you ever had attacks in which you fall and bite your tongue?
6. Have you ever had attacks in which you fall and lose control of your bladder?
7. Have you ever had brief attacks of shaking or trembling in one arm or leg or in the face?
8. Have you ever had attacks in which you lose contact with the surroundings and experience abnormal smells?
9. Have you ever been told that you have or had epilepsy or epileptic fits?

Any question 3 to 9 if affirmative renders the subject positive.

Annexure III

Questionnaire for risk factors for epilepsy

1. Is there a previous history of epileptic seizures in a first degree (parents, children, siblings) or relative?
2. Is there a previous history of epileptic seizures among your more distant relatives?
3. Did you have epileptic seizures associated with fever when you were younger than 5 years of age?
4. Have you, prior to onset of your epileptic seizures, ever had a febrile illness associated with either seizures, or loss of consciousness (brain fever)?
5. Have you, prior to onset of your epileptic seizure, suffered from head injury that leads to loss of consciousness for over one day?
6. Did you go to school?
7. If not, was it due to learning impairment?
8. Were you ever told that your performance in school was poor?
9. Did you ever drop out of school due to poor performance?
10. Have you suffered from any type of weakness of any limb leading to difficulty in walking or in using your hands?
11. If yes, is this impairment progressive?
12. Have you noted progress deterioration in memory/ calculation or recognition?
13. Do you know whether your birth took place at home/ hospital?
14. Was it attended or unattended?
15. Were you told that any problems were encountered during childbirth?

Annexure IV

Socio Economic Status

Patient ID:- Family Folder No._____ / NMEO No._____/ Pat No._____Date……

Name.....Name of Head of Family…… Age/Gender…….....

Mobile No ……. Address…….

Education……Occupation …… Religion: Hindu/ Sikh/

Other (specify) Non S.C./ Schedule Caste/ Backward class

Economic status of Family: Rich/ Moderately Rich/ Poor/ V.Poor

Caste:	Upper caste/	Artisan caste/	Lower caste	
	3	2	1	
Self / Husband's Occupation:	Cultivator/	Business/	Service/	Labourer
	4	3	2	1
Self / Husband's education:	Above Matric/	Matric/	below Matric/	No schooling
	4	3	2	1
Occupation:	Working at home/	Serving outside for money		
	2	1		
Mother's education:	Above Matric/	Matric/	below Matric/	No schooling
	4	3	2	1
Family Type:	Joint/	Nuclear		
	2	1		
Family Size:	Large	Medium	Small	
	3	2	1	
House Ownership:	Owns this & other/	Owns this/	Own(Part/ Parental)/	Own(on loan)/	Rented
	5	4	3	2	1
Household assets:	15	12-15	10-12	7-9	4-6	1-3	Nil
	6	5	4	3	2	1	0
Type of house:	Pucca	Mixed	Kacha				
	3	2	1				
No. of room:	Three	Two	One				
	3	2	1				
Drinking water facility:	Piped	Own Hand pump	Common Hand pump				
	3	2	1				

Maximum 39 Minimum 13

Less SES= Below 15 High SES= above 29

Middle SES 16-28

Current SES SCORE BY MUP METHOD=

Annexure-V

SUBJECT INFORMATION SHEET

Title: Towards developing a national epilepsy control program: A pilot, community-based, cluster randomized trial of delivery of care to people with epilepsy.

Dear Sir/Madam,

We invite you to take part in this survey entitled, “Towards developing a national epilepsy control program: A pilot, community-based, cluster randomized trial of delivery of care to people with epilepsy” conducted under the aegis of Dayanand Medical College (DMC) & Hospital, Ludhiana and the Indian Council of Medical Research, New Delhi. This project has been approved by the Ethics Committees of Dayanand Medical College & Hospital. The study has been designed in order to determine the optimal method of ensuring safe and effective community treatment of epilepsy in India.

Your participation in this study is entirely voluntary and will in no way affect the medical care privileges offered to you by the rural health center or Dayanand Medical College and Hospital.

As a part of the study, a field worker, trained at Dayanand Medical College Hospital, Ludhiana will contact you. He or she will be accompanied by the rural health worker who regularly frequents your house. The field worker will administer a questionnaire to you. This would take about 5 minutes of your time. You are free to decline to answer the questionnaire. The questionnaire comprises of a set of 9 questions and is able to determine if you possibly have suffered from epileptic fits in the past. If you

are found to screen positive on the basis of this questionnaire, we will then invite you to visit the rural health center on an appointed day, where you will be examined by a neurologist. If the latter confirms you to be epileptic you will be called to the hospital on an appointed day for an EEG test. EEG involves the application of certain electrodes to the scalp with the help of a paste. It records your brain waves and helps in the diagnosis and treatment of epilepsy. These investigations are essentially harmless and facilitate in the treatment of epilepsy. The neurologist will also offer you advice on the nature and treatment of epilepsy. As you are aware, the center provides essential medications for the treatment of epilepsy. Information obtained by way of this questionnaire will be kept strictly confidential. It will be fed into a stand-alone computer and then analyzed only after annonymisation. The data will be under the possession of Dr. Gagandeep Singh, Department of Neurology, Dayanand Medical College & Hospital, Ludhiana and only members of the study team will have access to this data.

If you are keen to participate in this survey, please indicate so by signing the consent form given below.

CONSENT FORM

I,…….s/o/d/o…… R/O …….. agree to participate in this study entitled “Towards developing a national epilepsy control program: A pilot, community-based, cluster randomized trial of delivery of care to people with epilepsy” and to fill up the questionnaire. My participation is entirely voluntary.

Witness Signature……

Signature…… Full Name…….

Address…… Address……..

……. …….

…… …… …

Relationship to subject……. …….

Investigator

Signature……..

Full Name…….

Designation…….

Annexure VI

ਰੋਗੀ ਜਾਣਕਾਰੀ ਪੱਤਰ

ਰਾਸ਼ਟਰੀ ਪੱਧਰ ਤੇ ਮਿਰਗੀ ਕੰਟਰੋਲ ਪ੍ਰੋਗਰਾਮ ਨੂੰ ਵਿਕਸਿਤ ਕਰਨਾ: ਪਾਇਲਟ, ਸਮਾਜਿਕ ਪੱਧਰ, ਕਲਸਟਰ ਖਿੰਡਵਾ ਟਰਾਇਲ, ਤਾਂ ਕਿ ਮਿਰਗੀ ਨਾਲ ਪੀੜਿਤ ਲੋਕਾਂ ਦੀ ਸਹਾਇਤਾ ਹੋ ਸਕੇ।

ਸ਼੍ਰੀਮਾਨ/ਸ਼੍ਰੀਮਤੀ ਜੀ,

ਅਸੀਂ ਤੁਹਾਨੂੰ ਸਾਰਿਆਂ ਨੂੰ ਇਸ ਅਧਿਐਨ ''ਰਾਸ਼ਟਰੀ ਪੱਧਰ ਤੇ ਮਿਰਗੀ ਕੰਟਰੋਲ ਪ੍ਰੋਗਰਾਮ ਦੇ ਵਿਕਾਸ ਜਿਸ ਵਿੱਚ ਉਹਨਾਂ ਲੋਕਾਂ ਦਾ ਇਲਾਜ ਕੀਤਾ ਜਾਂਦਾ ਹੈ ਜੋ ਮਿਰਗੀ ਦੇ ਦੌਰੇ ਤੋਂ ਪੀੜਤ ਹਨ'' ਵਿੱਚ ਭਾਗ ਲੈਣ ਲਈ ਸਹਿਮਤੀ ਲੈ ਰਹੇ ਹਾਂ। ਇਹ ਮੁਹਿਮ ਦਇਆਨੰਦ ਮੈਡੀਕਲ ਕਾਲਜ ਅਤੇ ਹਸਪਤਾਲ, ਲੁਧਿਆਣਾ ਅਤੇ ਭਾਰਤੀ ਚਿਕਿਤਸਾ ਅਨੁਸੰਧਾਨ ਪਰੀਸ਼ਤ, ਨਵੀਂ ਦਿੱਲੀ ਦੇ ਅਧੀਨ ਲਾਗੂ ਕੀਤਾ ਗਿਆ ਹੈ। ਇਹ ਪ੍ਰੋਜੈਕਟ ਦਇਆਨੰਦ ਮੈਂਡੀਕਲ ਕਾਲਜ ਅਤੇ ਹਸਪਤਾਲ ਦੀ ਆਚਾਰ ਸਿਮਿਤੀ ਦੁਆਰਾ ਪ੍ਰਮਾਣਿਤ ਕੀਤਾ ਗਿਆ ਹੈ। ਇਸ ਖੋਜ ਵਿੱਚ ਇਹ ਦੇਖਿਆ ਜਾਂਦਾ ਹੈ ਕਿ ਭਾਰਤ ਵਿੱਚ ਚੱਲ ਰਹੇ ਮਿਰਗੀ ਦੇ ਦੋਰੇ ਦੇ ਇਲਾਜ਼ ਕਰਨ ਦੇ ਢੰਗ ਸਹੀ ਅਤੇ ਸੁਰੱਖਿਅਤ ਹਨ।

ਇਸ ਅਧਿਐਨ ਵਿੱਚ ਤੁਹਾਡੀ ਭਾਗੀਦਾਰੀ ਸਵੈਵਿਸ਼ਕ ਹੋਵੇਗੀ, ਅਤੇ ਇਸ ਨਾਲ ਕਿਸੇ ਤਰੀਕੇ ਦਾ ਵੀ ਪੇਂਡੂ ਸਿਹਤ ਸੈਂਟਰ ਜਾਂ ਦਇਆਨੰਦ ਮੈਡੀਕਲ ਕਾਲਜ ਅਤੇ ਹਸਪਤਾਲ ਦੁਆਰਾ ਤੁਹਾਨੂੰ ਦਿੱਤੀਆਂ ਸੁਵਿਧਾਵਾਂ ਵਿੱਚ ਫਰਕ ਨਹੀਂ ਪਵੇਗਾ।

ਇਸ ਅਧਿਐਨ ਦੇ ਹਿੱਸੇ ਵਜੋਂ ਦਇਆਨੰਦ ਮੈਡੀਕਲ ਕਾਲਜ ਤੇ ਹਸਪਤਾਲ ਦਾ ਟਰੇਂਡ ਕੀਤਾ ਗਿਆ ਕਰਮਚਾਰੀ ਤੁਹਾਡੇ ਨਾਲ ਸੰਪਰਕ ਕਰੇਗਾ। ਉਹ ਤੁਹਾਡੇ ਇਲਾਕੇ ਵਿੱਚ ਪੈਂਦੇ ਪੇਂਡੂ ਸਿਹਤ ਕਰਮਚਾਰੀ ਨਾਲ ਮਿਲ ਕੇ ਤੁਹਾਡੇ ਘਰ ਆਵੇਗਾ। ਇਹ ਕਰਮਚਾਰੀ ਤੁਹਾਡੇ ਤੋਂ ਕੁਝ ਸਵਾਲ ਪੁੱਛੇਗਾ ਜਿਸ ਵਿੱਚ ਤੁਸੀਂ ਪੰਜ ਮਿੰਟ ਲੈ ਸਕਦੇ ਹੋ ਅਤੇ ਤੁਸੀ ਆਪਣੀ ਮਰਜੀ ਨਾਲ ਸਾਰੇ ਜਵਾਬ ਦੇ ਸਕਦੇ ਹੋ। ਇਸ ਪ੍ਰਸ਼ਨ–ਸੂਚੀ ਵਿਚ ਨੌ ਪ੍ਰਸ਼ਨ ਹੋਣਗੇ ਜਿਸ ਨਾਲ ਇਹ ਸਿੱਧ ਹੋ ਸਕਦਾ ਹੈ ਕਿ ਤੁਸੀ ਭੂਤਕਾਲ ਵਿਚ ਮਿਰਗੀ ਤੋਂ ਪੀੜਤ ਸੀ ਜਾਂ ਨਹੀਂ। ਜੇ ਤੁਹਾਨੂੰ ਇਸ ਪ੍ਰਸ਼ਨ–ਸੂਚੀ ਦੇ ਆਧਾਰ ਤੇ ਮਿਰਗੀ ਦੇ ਰੋਗੀ ਪਾਏ ਜਾਂਦੇ ਹਨ ਤਾਂ ਤੁਹਾਨੂੰ ਨਿਯਮਿਤ ਕੀਤੇ ਗਏ ਦਿਨਾਂ ਦੌਰਾਨ ਪੇਂਡੂ ਸਿਹਤ ਸੈਂਟਰ ਵਿੱਚ ਬੁਲਾਇਆ ਜਾਵੇਗਾ। ਜਿੱਥੇ ਤੁਹਾਨੂੰ ਨਿਊਰੋਲੋਜਿਸਟ ਦੁਆਰਾ ਚੈੱਕ ਕੀਤਾ ਜਾਵੇਗਾ। ਜੇ ਇਹ ਸਿੱਧ ਹੋ ਜਾਂਦਾ ਹੈ ਕਿ ਤੁਸੀਂ ਮਿਰਗੀ

ਤੋਂ ਪੀੜਤ ਹੋ ਤਾਂ ਤੁਹਾਨੂੰ ਹਸਪਤਾਲ ਵਿੱਚ ਨਿਯਤ ਦਿਨਾਂ ਉੱਤੇ ਹਸਪਤਾਲ ਵਿੱਚ ਕੁੱਝ ਟੈਸਟ ਜਿਵੇਂ ਕਿ ਸਿਰ ਦੀ ਅਤੇ EEG ਲਈ ਬੁਲਾਇਆ ਜਾਵੇਗਾ।

ਇਹ ਦਿਮਾਗ ਦੀਆਂ ਤਰੰਗਾਂ ਨੂੰ ਰਿਕਾਰਡ ਕਰਦਾ ਹੈ ਅਤੇ ਇਹ ਮਿਰਗੀ ਦਾ ਨਿਰੀਖਣ ਅਤੇ ਇਲਾਜ ਕਰਨ ਵਿੱਚ ਮਦਦ ਕਰਦਾ ਹੈ। ਇਹ ਅਧਿਐਨ ਨੁਕਸਾਨ ਰਹਿਤ ਹੈ ਅਤੇ ਮਿਰਗੀ ਦਾ ਇਲਾਜ ਕਰਨ ਵਿੱਚ ਮਦਦ ਕਰਦਾ ਹੈ। ਨਿਊਰੋਲੋਜਿਸਟ ਤੁਹਾਨੂੰ ਮਿਰਗੀ ਅਤੇ ਇਲਾਜ ਬਾਰੇ ਸਲਾਹ ਦੇਵੇਗਾ। ਮਿਰਗੀ ਦੇ ਇਲਾਜ ਲਈ ਜਰੂਰੀ ਦਵਾਈਆਂ ਸੈਂਟਰ ਦੁਆਰਾ ਮੁਹੱਈਆ ਕਰਵਾਈਆਂ ਜਾਣਗੀਆਂ।

ਇਸ ਪ੍ਰਸ਼ਨਸੂਚੀ ਦੁਆਰਾ ਪ੍ਰਾਪਤ ਜਾਣਕਾਰੀ ਗੁਪਤ ਰੱਖੀ ਜਾਵੇਗੀ। ਤੁਹਾਡੇ ਸਾਰੇ ਅੰਕੜੇ ਡਾ. ਗਗਨਦੀਪ ਸਿੰਘ ਅਤੇ ਇਸ ਸਰਵੇਖਣ ਟੀਮ ਦੇ ਮੈਂਬਰਾਂ ਜੋ ਕਿ ਦਇਆਨੰਦ ਮੈਡੀਕਲ ਕਾਲਜ ਅਤੇ ਹਸਪਤਾਲ ਨਾਲ ਸੰਪਰਕ ਰੱਖਦੇ ਹਨ ਉਨਾਂ ਦੀ ਪਹੁੰਚ ਤੋਂ ਬਾਹਰ ਨਹੀਂ ਜਾਵੇਗਾ।

ਜੇ ਤੁਸੀਂ ਇਸ ਮੁਹਿੰਮ ਜਾਂ ਅਧਿਐਨ ਵਿੱਚ ਭਾਗ ਲੈਣਾ ਚਾਹੁੰਦੇ ਹੋ ਤਾਂ ਤੁਸੀ ਹੇਠ ਲਿਖੇ ਫਾਰਮ ਤੇ ਦਸਤਖਤ ਕਰ ਕੇ ਭਾਗ ਲੈ ਸਕਦੇ ਹੋ।

ਸੁਚਿਤ ਸਹਿਮਤੀ ਪ੍ਰਪੱਤਰ

ਮੈਂ ..... ਪੁੱਤਰ/ਪੁੱਤਰੀ/ਪਤਨੀ..... ਆਪਣੀ ਮਰਜੀ ਨਾਲ ਉਪਰੋਕਤ ਅਧਿਐਨ ਵਿੱਚ ਸ਼ਾਮਲ ਹੋਣ ਲਈ ਸਹਿਮਤ ਹਾਂ। ਮੇਰੀ ਭਾਗੀਦਾਰੀ ਪੂਰੀ ਤਰ੍ਹਾਂ ਸਵੈਵਿਸ਼ਕ ਹੈ।

ਗਵਾਹ	ਦਸਤਖਤ.....
ਦਸਤਖਤ.....	ਪੂਰਾ ਨਾਮ.....
ਪਤਾ.....	ਪਤਾ.....
.....	.....
.....	.....
ਰੋਗੀ ਨਾਲ ਸੰਬੰਧ	.....

Annexure VII

रोगी जानकारी–पत्र

राष्ट्रीय स्तर पर मिर्गी कंट्रोल प्रोग्राम को विकसित करनाः पायलट, समाजिक स्तर, कलस्टर घिंडव घिंडवा परीक्षण, जिससे कि मिर्गी से पीड़ित लोगों की सहायता हो सके।

श्रीमान/श्रीमती जी,

हम आप सभी को इस अध्ययन ''राष्ट्रीय स्तर पर मिर्गी कंट्रोल प्रोग्राम के विकास जिसमें उन लोगों का इलाज किया जाता है जो मिर्गी के दौरों से पीड़ित हैं'' में भाग लेने के लिए आमंत्रित करते हैं। यह मुहिम दयानंद मैडीकल कॉलज एवं हस्पताल, लुधियाना और भारतीय चिक्तिसा अनुसंधान परिषद नई दिल्ली के अधीन लागू किया गया है। यह प्रोजैक्ट दयानंद मैडीकल कालज एवं हस्पताल की आचार समिति द्वारा प्रमाणित किया गया है। इस खोज में यह देखा जाता है कि भारत में चल रहे मिर्गी के दौरे के इलाज करने के ढंग सही औ सुरक्षित हैं।

इस अध्ययन में आपकी भागीदारी पूरी तरह स्वैच्छिक होगी और इसके द्वारा किसी तरीके से भी ग्राम सेहत सैंटर अथवा दयानंद मैडीकल कॉलज एवं हस्पताल द्वारा आप को दी गई सुविधाओं में अंतर नहीं पड़ेगा।

इस अध्ययन के हिस्से के आधार पर दयानंद मैडीकल कालज एवं अस्पताल का प्रशिक्षित किए गए कर्मचारी आपके साथ संपर्क करेगा। वह आपके इलाके में पड़ते ग्रामीण सेहत कर्मचारी के साथ मिल कर आपके घर तक पहुँचेगा। यह कर्मचारी आप से कुछ सवाल पूछेगा, जिस में आप पांच मिनट ले सकते हैं और आप अपनी मर्जी से सारे जवाब दे सकते हो। इस प्रश्न सूची में नौ प्रश्न होंगे जिस से यह सिद्ध हो सकता है कि आप भूतकाल में मिर्गी से पीड़ित थे अथवा नहीं। अगर आप इस प्रश्न सूची के आधार पर मिर्गी के रोगी पाए जाते हैं तो आपको नियमित किये गये दिनों के दौरान रुरल हैलथ सैंटर में बुलाया जाएगा। जहाँ आपको न्यूरोलोजिस्ट द्वारा चैक किया जाएगा। अगर यह सिद्ध हो जाता है कि आप मिर्गी से पीड़ित हो तो अस्पताल में नियत दिनों पर कुछ टैस्ट और EEG के लिए बुलाया जाएगा।

यह दिमाग की तरंगों को रिकार्ड करेगा और यह मिर्गी का निरिक्षण और इलाज करने में मदद करता है। यह अध्ययन नुकसान रहित है और मिर्गी का इलाज

करने में मदद करता है। न्यूरोलोजिस्ट आपको मिर्गी और ईलाज के बारे में सलाह देगा। मिर्गी के ईलाज के लिए जरूरी दवाईयाँ सैंटर द्वारा उपलब्ध करवाई जाएगी।

इस प्रश्न सूची द्वारा प्राप्त जानकारी गुप्त रखी जाएगी। आपका सारे आंकड़े डॉ. गगनदीप सिंह और इस जांच टीम के सदस्यों जो कि दयानंद मैडीकल कॉलज तथा हस्पताल से संपर्क रखते हैं, उनकी पहुँच से बाहर नहीं जाएँगे।

अगर आप इस मुहिम अथवा इस जांच में भाग लेना चाहते हैं तो आप निम्नलिखित फार्म पर हस्ताक्षर कर भाग ले सकते हैं।

सूचित सहमित प्रपत्र

मैं..... पुत्र/पुत्री/पत्नी..... अपनी मर्जी से उपरोक्त अध्ययन में शामिल होने के लिए सहमत हूँ। मेरी भागीदारी पूरी तरह स्वैच्छिक है।

गवाह

गवाह	हस्ताक्षर.....
हस्ताक्षर.....	पूरा नाम.....
पता.....	पता.....
.....	.....
.....	.....
प्रतिभागी से संबंध	.....

ANNEXURE VIII

Association between epilepsy and cysticercosis and toxocariasis: A population-based case–control study in a slum in India

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SUMMARY

Purpose: To assess the association between epilepsy and exposure to the parasites, Toxocara canis and Taenia solium in a slum-community in India.

Methods: A door-to-door survey to determine the prevalence of epilepsy was carried out by trained field workers. For every case, one age- and gender-matched control was selected from the same community. Serologic evaluation was carried out to detect antibodies against T. canis and T. solium.

Key Findings: The crude prevalence of active epilepsy was 7.2 per 1,000. Weenrolled 114 people with active epilepsy and 114 controls. The prevalence of antibodies to T. canis was similar in people with active epilepsy (4.7%; 5 of 106people) and in controls (5.7%; 6 of 106 people). The prevalence of antibodies to T. solium was 25.5% (27 of 106) in people with active epilepsy, significantly higher than in controls (12.3%; 13 of 106 cases; p = 0.02). Adjusted conditional (fixed-effects) logistic regression estimated an odds ratio of 2.8 (95% confidence interval 1.2–6.8) for detection of T. solium antibodies. Nineteen people with active epilepsy demonstrated evidence of neurocysticercosis (NCC) on magnetic resonance imaging (MRI), including 7 (36.5%) with solitary cysticercus granuloma.

Significance: Our findings do not support an association between epilepsy and exposure to T. canis in the community studied. A significant association between T. solium exposure and epilepsy was observed. Of those with active epilepsy and evidence of NCC on MRI, a large proportion demonstrated solitary cysticercus granuloma.

KEY WORDS: Epilepsy, Taenia solium, Toxocara canis, Enzyme-linked immunoelectrotransfer blot, Case– control.

Epilepsy is one of the most common neurologic disorders worldwide. The prevalence of active epilepsy is estimated to be between 6.2 and 7.6 per 1,000 population in developed countries (Granieri et al., 1983; Hauser et al., 1991) and 5–10 per 1,000 population in resource-poor countries (Aziz et al., 1994; Preux & Druet-Cabanc, 2005; Ngugi et al.,

2010).The high prevalence in resource-poor countries has been partly attributed to a greater frequency of a variety of infectious diseases, including helminthic infestations (Singh & Prabhakar, 2008).

Neurocysticercosis (NCC), caused by the larval stage of the cestode helminth, Taenia solium is the most common parasitic infestation of the brain (Garc_a et al., 2003). It is the main cause of late-onset epilepsy (or epileptic seizures) in some resource-poor countries (Medina et al., 1990; Pal et al., 2000). Several population-based, cohort and case– control studies, supported by clinical, pathologic, and experimental data have confirmed a causal association between T. solium cysticercosis and epilepsy (Del Brutto et al., 2005; Montano et al., 2005; Nicoletti et al., 2005; Rajshekhar et al., 2006; Prasad et al., 2008). These association studies have been largely based on serologic evidence of exposure to the parasite T. solium using the enzymelinked immunoelectrotransfer blot (EITB) assay (Tsang et al., 1989).

Human infestation with Toxocara species (including Toxocara canis, or dog roundworm, and T. catis, or cat roundworm) can occur in any of the following four types: visceral larva migrans, ocular larva migrans, covert toxocariasis, and common toxocariasis, although most human infestations are silent (Rubinsky-Elefant et al., 2010). Risk factors for human exposure are dog ownership, pica, and contact with soil contaminated with dog feces. Many early, poorly controlled studies suggested an association between T. canis exposure and epilepsy (Critchley et al., 1982).

More recently, case–control studies in Bolivia, Burundi, and Italy also suggested a statistically significant association between T. canis exposure and epilepsy (Nicoletti et al., 2002, 2007, 2008). Evidence of a brain lesion due to T. canis is limited to a few case reports (Mikhael et al., 1974; Hill et al., 1985); therefore, it is not clear whether T. canis is a risk factor for epilepsy. We undertook a population- based, case–control study to determine the association between both T. solium and T. canis exposure and epilepsy in a slum community in India.

Methods

We conducted a population-based, case–control study between June 2010 and February 2011 by carrying out a door-to-door survey for epilepsy with confirmation of diagnosis of epilepsy using a two-step protocol. The two explanatory variables were serologic evidence of exposure to T. solium and T. canis.

Survey area

The study was carried out in the Jamalpur urban field practice area of the Department of Social and Preventive Medicine, Dayanand Medical College, in Ludhiana, an industrial city in Punjab state in Northwest India. The city has a population of approximately 3 million. The registered population (inhabitants for at least 5 years) of the survey area was 15,750 and comprised 60% ethnic native Punjabis and 40% migrant laborers from elsewhere in India. Many people in the survey area shared dwellings (e.g., 5–6 families in small, 1–2 room tenements), and piped water was available to few; others used shared or separate handpumps.

Primary health care was provided by an urban health center run by staff from a teaching medical college in the city (one physician and two auxiliary nurse midwives), but many people preferred to visit private physicians for their health care needs.

Selection of cases and controls

Cases were selected in two phases:

Phase I: A door-to-door survey was conducted by two field workers using an epilepsy screening questionnaire adapted from previous epidemiologic studies of epilepsy (Placencia et al., 1992; Wang et al., 2003; Gourie-Devi et al., 2004). It was validated in 142 individuals, from the same geographical area, who attended a neurology clinic and underwent an epileptologic assessment by a neurologist (GS), yielding a sensitivity of 0.83 and specificity of 0.84.

Demographic components were adapted from a previous neuroepidemiologic study (Meneghini et al., 1991). The socioeconomic status of the families was recorded on a modified Udai Pareek Scale (Pareek & Trivedi, 1979). Two additional structured questionnaires, one for risk factors for epilepsy and the other for assessment of risk of T. canis or T. solium infestations, were designed and were completed by subjects. Field workers were especially recruited for the study and were intensively trained in survey methods over a 2-month period.

Phase II: An epileptologist conducted a complete neurologic assessment in all individuals who screened positive between July 2010 and April 2011. Those with inactive epilepsy, nonepileptic seizures, and single seizures were excluded. Those with active epilepsy underwent sleep and awake digitized electroencephalography (EEG) examinations (Natlink Traveller, Biologic, Mundelein, IL, U.S.A.; 101 of 114 cases; 88.6%) and specialized epilepsy-protocol magnetic resonance imaging (MRI; 1.5 Tesla Magneto, Avento, 18 Channel; Siemens, Erlangen, Germany; 93 of 114 cases; 81.6%). When MRI showed evidence suggestive of active or inactive neurocysticercosis, previously proposed diagnostic criteria were applied to establish a diagnosis of cysticercotic infestation (Del Brutto et al., 2001). Clinical, EEG, and imaging data for all cases were double-entered into structured proformas and maintained in a database.

For each case, an age- and gender-matched, healthy (with no known neurologic disorder or history of seizures or epilepsy) control (n = 114) was randomly selected from the same study area. Age matching was €2 years for age >10 years and €1 year for age £10 years. All controls completed the screening questionnaire for epilepsy and were excluded if they screened positive. The controls also completed the questionnaires for risk factors.

Classification of epilepsies

Epilepsy was defined and categorized according to the epidemiologic criteria of the International League Against Epilepsy (ILAE) (Commission on Epidemiology and Prognosis, ILAE, 1993). Active epilepsy was defined as having had at least two epileptic seizures, including one in the previous 5 years, regardless of any antiepileptic drug (AED) treatment (Commission on Epidemiology and Prognosis, ILAE, 1993).

Blood sampling and serologic evaluations

Venous blood samples, collected from 106 cases (93%) and 114 controls were immediately separated and frozen at) 80_C. Later, the sera were assayed to detect antibodies against T. canis using commercially available enzymelinked immunosorbent assay (ELISA) (In Vitro Diagnostic Research, Carlsbad, CA, U.S.A.) and T. solium using an enzyme-linked EITB assay (Immunetics, Boston, MA, U.S.A.; Brunello et al., 1986; Tsang et al., 1989) at the Department of Microbiology, Dayanand Medical College. The T. canis ELISA used an excretory/secretory (ES) antigen from Toxocara larvae to screen for serum immunoglobulin G (IgG) antibodies. The Toxocara ES antigen-based ELISA for the detection of IgG antibodies was 78–91% sensitive and 86–93% specific for the diagnosis of toxocariasis (Speiser & Gottstein, 1984; Jacquier et al., 1991). The results were read using an ELISA reader at 450/650–620 nm. Absorbance reading ‡0.3 optical density (OD) units was considered positive. Toxocara canis– ELISA positive sera were further subjected to an immunoblot (Toxocara Immunoblot IgG; LDBIO Diagnostics, Lyon, France) assay (Magnaval et al., 1991). The immunoblot used Toxocara ES antigens separated into low molecular weight (24–35 kDa) and high molecular weight (70– 90 and 200 kDa) bands. The presence of two or more low molecular weight bands was considered positive. Antibodies to antigens of low molecular weight (24–35 kDa) detected with western blot assay were considered highly specific for toxocariasis, thus avoiding problems of crossreactivity Rubinsky-Elefant et al., 2010). The EITB assay was conducted for the detection of T. solium IgG antibodies in serum with antigen-bearing nitrocellulose membrane using alkaline phosphatase as substrate. Antibodies against any of the six glycoprotein antigens of molecular weights 50, 42–39, 24, 21, 18, and 14 kDa were considered positive

(Tsang et al., 1989).

Statistical analysis

Data were analyzed using STATA version 9 (StataCorp, College Station, TX, U.S.A.). Univariate comparison for the explanatory variables (T. canis and T. solium seropositivity),

various baseline socioeconomic parameters, and risk factors for infection in cases and controls were first undertaken using the McNemar's test (for matched case–control studies). A p-value of <0.05 was considered significant.

Those variables for which p was <0.1 were entered into a multivariate analysis using fixed-effects conditional logistic regression to estimate an adjusted odds ratio.

Ethical considerations

The study was approved by the local institutional ethics committee. Informed consent was obtained from cases and controls (or parents or legal guardians in the case of children under the age of 12 years).

Sample size estimation

We assumed a population seroprevalence of T. canis exposure to be 20% based on epidemiologic surveys previously undertaken in India (Malla et al., 2002; Dar et al., 2008). An estimated 240 subjects (120 each of cases and controls) were required to detect an odds ratio (OR) of 2.0 with 80% power at a two-sided level of significance of 5%.

Results

Of 151 individuals who were screen positive, 37 were excluded; 20 had inactive epilepsy, 2 had single seizures, 8 had febrile seizures, and 7 had nonepileptic seizures. Therefore, 114 cases (69 [61%] male) with active epilepsy remained. The crude prevalence of active epilepsy in the surveyed area was 7.2 per 1,000 population. Eight persons (7%) with epilepsy declined to provide blood samples, 13 (11.4%) did not undergo EEG examination, and in 21 (18%) cases, MRI could not be performed for various reasons (refusal, 14; anxiety, 3; pregnancy, 1; age <5 years, 3). Demographic, socioeconomic, and risk factor profiles of the cases and controls are provided in Table 1 (see Tables S1 and S2 in Supporting Information). Sera of 7 of the 106 people with epilepsy (7%) and 8 controls (8%) demonstrated anti-T. canis antibodies using ELISA. Toxocara canis-immunoblot assay conducted on ELISA-positive sera confirmed exposure to the parasite in five cases and six controls. Taenia solium-EITB assay was positive in 27 (25%) of the 106 cases in whom it was tested and 13 (12%) of 106 matched controls (p = 0.02). Conditional fixed-effects logistic regression analysis, adjusted for those baseline parameters for which p < 0.1 in the univariate analysis (Table 1), estimated an adjusted OR of 2.8 (95% confidence interval [CI] 1.2–6.8, p = 0.02) for seropositive status for T. solium. Two sensitivity analyses to account for the missing patients for whom the results of the EITB assay were not available were carried out: the ORs were recalculated, first assuming that all the missing cases were EITB positive and then assuming that they were all EITB

negative. The recalculated ORs were 3.8 (95% CI 1.6– 8.8; p = 0.002) and 2.8 (95% CI, 1.1–6.7; p = 0.02), respectively.

The adjusted odds ratio for exposure to T. canis was 0.82 (95% CI 0.2–3.8; p = 0.8). Antibodies to both T. solium (using EITB) and T. canis (with immunoblot) were simultaneously detectable in three cases and one control. MRI was undertaken in 93 (82%) of the 114 cases. Of 19 people (17%) with active epilepsy who had evidence of NCC on MRI, 7 (37%) had a solitary cysticercus granuloma, 7 (37%) solitary calcification, and 5 (26%) had multiple active and inactive calcified parenchymal cysticerci. Eight (42%) of the 19 with MRI evidence of NCC were seropositive for T. solium antibodies and 2 of the 19 were Toxocara ELISA positive (of which one was confirmed positive by Toxocara canis-immunoblot assay) (Table 2).

Table 1. Comparison of selected socioeconomic variables in cases and controls

Parameters	Cases (n = 106) (%)	Controls (n = 106) (%)	Statistical Significance (p)
Caste			
Upper Artisan or lower	31 (29.2) 75 (70.8)	35 (33) 71 (67)	0.49 (ns)
Self/Husband's occupation			
Business or service	43 (40.6)	41 (38.7)	0.75 (ns)
Laborer	63 (59.4)	65 (61.3)	
Education			
Above matric	10 (9.4)	16 (15.1)	0.21 (ns)

Below matric	96 (90.6)	90 (84.9)	
Occupation			
Working at home	68 (64.2)	62 (58.5)	0.35 (ns)
Serving outside for money	38 (35.9)	44 (41.5)	
Mother's education			
Above matric	4 (3.8)	1 (0.9)	0.22 (ns)
Below matric	102 (96.2)	105 (99.1)	
Family type			
Joint	16 (15.1)	20 (18.9)	0.48 (ns)
Nuclear	90 (84.9)	86 (81.1)	
Family size			
Large or medium	52 (49.1)	44 (41.5)	0.29 (ns)
Small	54 (50.9)	62 (58.5)	
Household ownership			
Own house	95 (89.6)	78 (73.6)	0.006
Rented	11 (10.4)	28 (26.4)	
Household assets			
10 or more	21 (19.8)	1 (0.9)	1.00 (ns)
Below 10	85 (80.2)	105 (99.1)	
Type of houses			
Pucca	64 (60.4)	58 (54.7)	0.43 (ns)
Kacha or mixed	42 (39.6)	48 (45.3)	
Number of rooms			
One	25 (23.6)	41 (38.7)	0.02

Two or three	81 (76.4)	65 (61.3)	
Drinking water facility			
Piped	95 (89.6)	82 (77.4)	0.02
Own or common hand pump	11 (10.4)	24 (22.6)	
Nonvegetarian food consumption	66 (62.3)	49 (46.2)	0.02
Pork consumption	7 (6.6)	2 (1.9)	0.12 (ns)
Washing hands after defecation	104 (98.1)	106 (100)	1.00 (ns)
Washing hands before eating meals	104 (98.1)	106 (100)	1.00 (ns)
Feeding of stray dogs	36 (33.9)	56 (52.8)	0.01

Caste refers to a social system of grading society based on hereditary rank, profession, or wealth. Self/Husband occupation refers to self-occupation if employed, else husband's occupation. Matric under category ''education'' refers to class 10. Categories under household assets refer to the number of items of economic value possessed by the family.

a Below matric under category education includes matric and no schooling also.

b''Own house'' under category house-ownership includes parental and houses on loan.

cPucca and dKacha under category ''type of houses'' refers to cemented and noncemented houses, respectively.

Table 2. Correlation between imaging findings and serologic studies in people with epilepsy and evidence of neurocysticercosis (n = 19) on MRI

Imaging	n (%)	Toxocara ELISA positive	Toxocara immunoblot positive	T. solium EITB Positive
Solitary cysticercus granuloma	7 (36.8)	1		2
Solitary calcification	7 (36.8)			4
Multiple lesions	5 (26.3)	1	1	2
Total	19	2	1	8

EITB, enzyme-linked immunoelectrotransfer blot; ELISA, enzyme-linked immunosorbent assay.

Of the 19 subjects 12 had definitive NCC as per criteria described elsewhere (Del Brutto et al., 2001) including four with a solitary cysticercus granuloma, four with multiple lesions, and four with solitary calcification. MRI was performed in 93 of 114 cases.

Discussion

The population assessed was carefully selected, as there were stray dogs and pigs in the community and it typically represented a low socioeconomic area. Most inhabitants were daily wage workers, often migrant laborers. Hence, the community represented a population that was at high risk for acquiring both T. solium and T. canis infections. We were able confirm an association between T. solium seropositive

status and epilepsy, but no such association was found between T. canis seropositive status and epilepsy.

This is in contrast with recent data from rural-community studies in Bolivia and Burundi and a hospital-based study from Italy, which suggested an association between T. canis exposure and epilepsy (Nicoletti et al., 2002, 2007, 2008). In the Bolivian study, the adjusted OR was 2.70 (95% CI 1.4–5.2), in the Burundi study it was 2.1 (95% CI 1.2–3.8), and in the Italian study it was 3.9 (95% CI, 1.9–8.0). There are many possible explanations for the differences in the findings of our study and those of the previous studies, including differences in population attributes (such as genetic make-up, risk-factor profiles and behaviors, and low endemicity) and methodologic characteristics (e.g., exclusion of single seizures or inactive epilepsy). In two of the previous studies, there appeared to be a high risk of exposure in the community (12% in Bolivian study and 51% in Burundian study) compared with our population in which the seropositivity rate among controls was 5.7% (Nicoletti et al., 2002, 2007). The baseline seropositivity rates for the community studied have not been determined, but rates in other communities in India are in the order of 6–33% (Malla et al., 2002; Mirdha & Khokar, 2002; Traub et al., 2002, 2005; Dar et al., 2008). Hence, while estimating sample size a baseline seropositivity rate of 20% was assumed.

Our study confirms the association between T. solium parasite exposure and epilepsy in the field setting. The association has been established in rural South India and in several rural studies in Latin America (Del Brutto et al., 2005; Montano et al., 2005; Nicoletti et al., 2005; Rajshekhar et al., 2006). Seropositivity was higher in people with active epilepsy in our study (25%) than in the study from rural South India (13%) (Rajshekhar et al., 2006), although there were differences in serologic methods employed in the two studies.

We used MRI to study the association between epilepsy and cysticercosis. Computerized tomography (CT) was used in the population-based studies from Latin America (including Bolivia, Peru, and Ecuador) and in these studies, high frequencies of single or multiple calcifications were observed in both people with epilepsy and asymptomatic individuals (Del Brutto et al., 2005; Montano et al., 2005; Nicoletti et al., 2005). In the field studies from Latin America, single or multiple calcific lesions were found in about two thirds of people with NCC. The remainder were either live, active (vesicular) cysticerci or, very rarely, single cysticercus granulomas (Del Brutto et al., 2005; Montano et al., 2005; Nicoletti et al., 2005). In our study, more than one third of all NCC cases had solitary cysticercus granuloma and another one third had calcific NCC. In the study from South India, 7% of people had solitary cysticercus granuloma (Rajshekhar et al., 2006), whereas in a study from a pig-farming rural community, about one fourth of people with NCC had solitary granuloma (Prasad et al., 2008). Therefore, a single cysticercus lesion in the granulomatous stage appears to be a common finding in field studies from India but not from Latin America. This could be due to differences in the imaging methods used. Two of the Latin American field

studies used routine (noncontrast) CT scanning, whereas one used contrast-enhanced CT scans. It is possible that granulomas were missed on routine CT scans, as the administration of contrast is required to visualize granulomas on CT scans. On the other hand, the larger proportion of solitary cysticercus granulomas in our study as well as other studies from India than in studies from Latin America could be due to geographic and ethnic differences between the two populations (Del Brutto et al., 2005; Montano et al., 2005; Nicoletti et al., 2005; Rajshekhar et al., 2006; Prasad et al., 2008). Indeed, several hospitalbased studies from India have shown a high frequency of solitary cysticercus granulomas in people with seizures and epilepsy (Chandy et al., 1989; Murthy & Subba Reddy, 1998). Solitary cysticercus granulomas constitute a relatively lower proportion (approximately 20%) of hospitalbased

cohorts of NCC from Latin America (Del Brutto, 1995). Theoretically, a solitary granuloma represents degeneration occurring at a relatively early stage in evolution of the cysticercus compared with a live, active cyst, which may suggest immune evasive mechanisms developed by the cysticercus over long periods. It may be that a lower disease burden and lesser degree of exposure to the parasite in the Indian subcontinent leads to a relatively early degeneration of the cyst and granuloma formation (Garcia et al., 2010). Of interest, of the 27 T. solium–seropositive cases, MRI (undertaken in 96%) demonstrated evidence of NCC in 8 (30.8%). This could be due to infestation in the past that has since resolved, extraneural cysticercosis (e.g., in the muscle or skin), or residual-calcified NCC, which could be missed on the MRI. Limitations of the study include a potential selection bias and the potential statistical under powering of the study.

The particular population in our study was selected mainly due to convenience, as catchment area formed the field practice area of the medical college and this may represent a selection bias. Another potential source of bias might be the large proportion of migrant population, the proportion of which is higher than the average proportion of interstate migrants in India (14%) (Government of India, Ministry of Home Affairs, 2001). We do, however, feel that these are not sufficient to have changed significantly the results. While calculating the sample size for the study, we assumed a baseline seropositivity rate of 20%. Because we found a low seroprevalence for T. canis, it is possible that the chosen sample size was insufficient to detect a difference between cases and controls. However, in view of the lower seropositivity in cases than in controls, it is unlikely that a larger sample size would have suggested an association between T. canis exposure and epilepsy.

Conclusions

This population-based survey of active epilepsy in a slum area in India failed to confirm an association between exposure to T. canis and epilepsy. A significant association between T. solium exposure and epilepsy, however, confirms that this parasite is an important risk factor for epilepsy.

The imaging spectrum of NCC in the community in India comprises a high proportion of individuals with solitary cysticercus granuloma, a finding that is in contrast to the spectrum observed in Latin America, where calcific lesions are the most common finding. The reasons for the high frequency of solitary granulomas in India need to be determined.

Annexure – IX

Self-reported Medication-taking Scales and Item-to-total Correlation Coefficients*

		Corrected item-to-total correlation
1.	**Do you ever forget to take your medicine?**	
2.	**Are you careless at times about taking your medicine?**	
3.	**When you feel better do you sometimes stop taking your medicine?**	
4.	**Sometimes if you feel worse when you take the medicine, do you stop taking it?**	

Scoring: high-low; yes =0; no = 1

Range: 0 -4

*This scale will be administered once a month.

Annexure – X

Modified Kilifi Epilepsy Beliefs and Attitude*

Items of each subscale	Not at al	Believe a little	Totally believe
Causes of epilepsy			
1. Epilepsy is inherited			
1. Head injury			
1. Injury at birth			
1. Malaria/ fever			
1. Brain damage			
Biomedical treatment			
1. It is possible to treat epilepsy			
1. AED's should be taken continuously for them to work			
1. AEDs are available in health facilities			
1. Febrile convulsions are better treated by doctor			
1. PWE should be put in a safe place during a fit			
1. AEDs control seizures			
1. Missing AEDs can make PWE fit			
1. Epilepsy is better treated by a doctor			
1. AEDs can cause side effects			
Cultural treatment			
1. PWE who are burnt never get healed			
1. Febrile convulsions are treatable but not epilepsy			
1. Epilepsy is better treated by a traditional healer			
1. Pouring water on PWE during a fit treats epilepsy			
1. Smearing paraffin on PWE during a fit			
1. Fumigation treats epilepsy			
1. It is good to put a stick in the mouth of PWE during a fit			

1. **Joints of PWE should be straightened during a fit**			
1. **Febrile convulsions are better treated by a traditional healer**			
Risks and safety concerns			
1. **PWE should not/cannot climb trees**			
1. **PWE should not/cannot drive**			
1. **PWE should avoid being near fires**			
1. **PWE should avoid being near water**			
Negative attitude			
1. **PWE should not/cannot marry**			
1. **PWE should not/cannot go to school**			
1. **PWE should not/cannot have a job**			
1. **PWE should not/cannot lead a normal life**			
1. **PWE should be isolated**			
1. **PWE should be rejected**			
1. **PWE should be resented**			
1. **PWE are a burden**			
1. **PWE perform poorly in school**			
1. **PWE are dull**			
1. **PWE are mad**			

Items to be preceded by the phrase: I believe....

The scoring procedure: 0 = not at all, 1 = believe a little, 2 = totally believe and missing (.) = don't know. Positive questions are those in which "totally believe" was the most positive belief or attitude with a score of "2". The reverse scoring will be used for negative questions where "not at all" will be the most positive belief or attitude with a score of "2". Thus the ranges of the total scores for the five subscales are:

causes of epilepsy: 0-22; biomedical treatment:1-26; cultural treatment; 0-18; risk and safety concerns: 0-10 and negative attitudes: 0-24. Higher scores reflect more positive beliefs and attitudes about epilepsy.

*This scale will be administered once in the beginning and then at the end of the study.

Annexure – XI

TSQM (Version II): Treatment Satisfaction Questionnaire for Medication*

1. How satisfied or dissatisfied are you with the ability of the medication to prevent or treat the condition?		
i. Strongly Dissatisfied	**1**	
i. Somewhat Dissatisfied	**2**	
i. Neither satisfied nor dissatisfied	**3**	
i. Somewhat Satisfied	**4**	
i. Satisfied	**5**	
i. Very Satisfied	**6**	
i. Strongly Satisfied	**7**	
1. How satisfied or dissatisfied are you with the way the medication relieves symptoms ?		
i. Strongly Dissatisfied	**1**	
i. Somewhat Dissatisfied	**2**	
i. Neither satisfied nor dissatisfied	**3**	
i. Somewhat Satisfied	**4**	
i. Satisfied	**5**	
i. Very Satisfied	**6**	
i. Strongly Satisfied	**7**	
1. As the result of taking this medication, do you experience any side effect at all ?		
i. Yes	**1**	
i. No	**2**	
1. How dissatisfied are you by side effects that interfere with your physical health and ability to function (e.g., strength, energy levels)?		
i. Strongly Dissatisfied	**1**	
i. Somewhat Dissatisfied	**2**	
i. Neither satisfied nor dissatisfied	**3**	
i. Somewhat Satisfied	**4**	
i. Satisfied	**5**	
i. Very Satisfied	**6**	
i. Strongly Satisfied	**7**	

1. How dissatisfied are you by side effects that interfere with your mental function (e.g., ability to think clearly, stay awake)?		
i. Strongly Dissatisfied	**1**	
i. Somewhat Dissatisfied	**2**	
i. Neither satisfied nor dissatisfied	**3**	
i. Somewhat Satisfied	**4**	
i. Satisfied	**5**	
i. Very Satisfied	**6**	
i. Strongly Satisfied	**7**	
1. How dissatisfied are you by side effects that interfere with your mood or emotions (e.g., anxiety/fear, sadness, irritation/anger)?		
i. Strongly Dissatisfied	**1**	
i. Somewhat Dissatisfied	**2**	
i. Neither satisfied nor dissatisfied	**3**	
i. Somewhat Satisfied	**4**	
i. Satisfied	**5**	
i. Very Satisfied	**6**	
i. Strongly Satisfied	**7**	
1. How satisfied or dissatisfied are you are with how easy the medication is to use?		
i. Strongly Dissatisfied	**1**	
i. Somewhat Dissatisfied	**2**	
i. Neither satisfied nor dissatisfied	**3**	
i. Somewhat Satisfied	**4**	
i. Satisfied	**5**	
i. Very Satisfied	**6**	
i. Strongly Satisfied	**7**	
1. How satisfied or dissatisfied are you are with how easy it is to plan when you will use the medication each time?		
i. Strongly Dissatisfied	**1**	
i. Somewhat Dissatisfied	**2**	
i. Neither satisfied nor dissatisfied	**3**	
i. Somewhat Satisfied	**4**	
i. Satisfied	**5**	

i. **Very Satisfied** **6**	
i. **Strongly Satisfied** **7**	
1. How satisfied or dissatisfied are you by how often you are expected to use/take the medication?	
i. **Strongly Dissatisfied** **1**	
i. **Somewhat Dissatisfied** **2**	
i. **Neither satisfied nor dissatisfied** **3**	
i. **Somewhat Satisfied** **4**	
i. **Satisfied** **5**	
i. **Very Satisfied** **6**	
i. **Strongly Satisfied** **7**	
1. How satisfied are you that the good things about the medication outweigh the bad things?	
i. **Strongly Dissatisfied** **1**	
i. **Somewhat Dissatisfied** **2**	
i. **Neither satisfied nor dissatisfied** **3**	
i. **Somewhat Satisfied** **4**	
i. **Satisfied** **5**	
i. **Very Satisfied** **6**	
i. **Strongly Satisfied** **7**	
1. Taking all thing into account, how satisfied or dissatisfied are you with this medication?	
i. **Strongly Dissatisfied** **1**	
i. **Somewhat Dissatisfied** **2**	
i. **Neither satisfied nor dissatisfied** **3**	
i. **Somewhat Satisfied** **4**	
i. **Satisfied** **5**	
i. **Very Satisfied** **6**	
i. **Strongly Satisfied** **7**	

SCALE SCORING ALGORITHM: TSQM Scale scores range from 0 to 100 and no computed score should be lower or higher than these limits.

EFFECTIVENESS: ([(Item 1+ Item 2) -2] divided by (12) * 100

SIDE EFFECT: ([Sum of Item 4 to Item 6) – 3] divided by 12)*100

If one item is missing: ([(Sum of the two completed items) -2] divided by (8) * 100

CONVENIENCE: ([Sum of Item 7 to Item 9] - 3] divided by 18)*100

If one item is missing: ([(Sum of the two completed items)-2] divided by (12) * 100

GLOBAL SATISFACTION: ([Sum of item 10 to Item 11) -2] divided by 12)*100

*This scale will be administered once in three months

Annexure – XII

Sample items from brief medication questionnaire*

Please list below all of the medications you took in the PAST WEEK. For each medication you list, Please answer each of the questions in the box below.

a.Medication name and strength	b. How many days did you take it?	c. How many times per day did you take it?	d. How many pills did you take each time?	e. How many times did you miss taking a pill?	f. For what reason were you taking it?	g.How well does the medicine work for you? 1= well 2= okay 3 = not well

2. Do any medication bother you in any way? Yes No

a. If yes please name the medication and check below how much it bothers you

Medication name	How much did it bother you?				
	A lot	Some	A little	Never	In what way did it bother you?

3. Below is a list of problems that people sometimes have their medicines. Please check how hard it is for you to do each of the following:

	Very hard	Somewhat hard	Not hard at all	COMMENT (Which medicine)
a. <u>Open or close</u> the medication bottle				

a. <u>Read the print</u> on the table				
a. <u>Remember</u> to take all the pills				
a. <u>Get</u> your refills at time				
a. <u>Take so many pills</u> at the same time				

SCORING PROCEDURE FOR BMQ SCREENS

Screen	**Scoring**	
Regimen Screen (Question 1a - 1e)	**1 = Yes**	**0 = No**
Did R fail to list the prescribed drug in the initial (spontaneous) report?	**1 = Yes**	**0 = No**
Did R stop or interrupt therapy due to a late refill or other reason?	**1 = Yes**	**0 = No**
Did R report any missed days or doses?	**1 = Yes**	**0 = No**
Did R reduce or cut down the prescribed amount per doze?	**1 = Yes**	**0 = No**
Did R take any extra doses or more medication than prescribed?	**1 = Yes**	**0 = No**
Did R report "don't know" in responses to any question?	**1 = Yes**	**0 = No**
Did R refuse to answer any question?	**1 = Yes**	**0 = No**
NOTE: Score of ≥ 1 indicates positive screen for potential non adherence		
Belief Screen (Questions 1g & 2-2a)		
Did R report "not well" or "don't know" in response to question 1g	**1 = Yes**	**0 = No**
Did R name prescribed drug as a drug that bothers him/her ?	**1 = Yes**	**0 = No**
NOTE: Score of ≥ 1 indicates positive screen for belief barriers		
Recall Screen (Question 1c & 3c)		
Did R receive a multiple dose regime (two or more times per day)?	**1 = Yes**	**0 = No**
Did R report "very hard" or "somewhat hard" in response to question 3c	**1 = Yes**	**0 = No**
NOTE: Score of ≥ 1 indicates positive screen for recall barriers		

*This scale will be administered once a month.

Annexure – XIII

QUALITY OF LIFE IN EPILEPSY: QOLIE-31 (*Version 1.0*)

Today's Date _____/_____/_____/
mm dd yy

Name _____

Age _____(years)

INSTRUCTIONS

The QOLIE-31 is a survey of health-related quality of life for adults (18 years or older) with epilepsy. Adolescents (ages 11-17 years) should complete the QOLIE-AD-48, designed for that age group. This questionnaire should be completed only by the person who has epilepsy (not a relative or friend) because no one else knows how YOU feel.

There are 31 questions about your health and daily activities. Answer every question by circling the appropriate number (1, 2, 3...). If you are unsure about how to answer a question, please give the best answer you can and write a comment or explanation on the side of the page. These notes may be useful if you discuss the QOLIE-31 with your doctor. Completing the QOLIE-31 before and after treatment changes may help you and your doctor understand how the changes have affected your life.

This copy of the QOLIE-31 is provided by www.epilepsy.com, your source for epilepsy information, and the QOLIE Development Group. We wish you success in living your life with epilepsy!

1. Overall, how would you rate your quality of life?

(Circle one number on the scale below)

These questions are about how you **FEEL** and how things have been for you during the **past 4 weeks**. For each question, please indicate the one answer that comes closest to the way you have been feeling.

How much of the time during the **past 4 weeks...**

(Circle one number on each line)

		All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
2.	Did you feel full of pep?	1	2	3	4	5	6
3.	Have you been a very nervous person?	1	2	3	4	5	6
4.	Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
5.	Have you felt calm and peaceful?	1	2	3	4	5	6
6.	Did you have a lot of energy?	1	2	3	4	5	6
7.	Have you felt downhearted and blue?	1	2	3	4	5	6
8.	Did you feel worn out?	1	2	3	4	5	6
9.	Have you been a happy person?	1	2	3	4	5	6
10.	Did you feel tired?	1	2	3	4	5	6
11.	Have you worried about having another seizure?	1	2	3	4	5	6
12.	Did you have difficulty reasoning and solving problems (such as making plans, making decisions, learning new things)?	1	2	3	4	5	6

13.	Has your health limited your social activities (such as visiting with friends or close relatives)?	1	2	3	4	5	6

14. How has the **QUALITY OF YOUR LIFE** been during the **past 4 weeks** (that is, how have things been going for you)?

(Circle one number)

Very well: could hardly be better	Pretty good	Good & bad parts about equal	Pretty bad	Very bad: could hardly be worse
1	2	3	4	5

The following question is about **MEMORY**.

(Circle one number)

		Yes, a great deal	Yes, somewhat	Only a little	No, not at all
15.	In the past 4 weeks, have you had any trouble with your memory?	1	2	3	4

Circle one number for **how often** in the **past 4 weeks** you have had trouble *remembering* or **how often** this memory problem has interfered with your normal work or living.

		All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
16.	Trouble remembering things people tell you	1	2	3	4	5	6

The following questions are about **CONCENTRATION** problems you may have. Circle one number for **how often** in the **past 4 weeks** you had trouble concentrating or **how often** these problems interfered with your normal work or living.

		All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
17.	Trouble concentrating on reading	1	2	3	4	5	6
18.	Trouble concentrating on doing one thing at a time	1	2	3	4	5	6

The following questions are about problems you may have with certain **ACTIVITIES**. Circle one number for **how much** during the **past 4 weeks** your epilepsy or antiepileptic medication has caused trouble with...

		A great deal	A lot	Some-what	Only a little	Not at all
19.	Leisure time (such as hobbies, going out)	1	2	3	4	5
20.	Driving	1	2	3	4	5

The following questions relate to the way you **FEEL** about your **seizures.**

(Circle one number on each line)

		Very fearful	Somewhat fearful	Not very fearful	Not fearful at all
21.	How fearful are you of having a seizure during the next month?	1	2	3	4

		Worry a lot	Occasionally worry	Don't worry at all
22.	Do you worry about hurting yourself during a seizure?	1	2	3

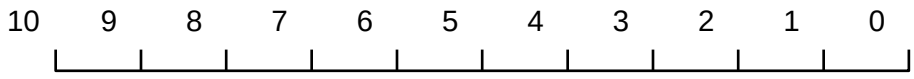
		Very worried	Somewhat worried	Not very worried	Not at all worried
23.	How worried are you about embarrassment or other social problems resulting from having a seizure during the next month?	1	2	3	4
24.	How worried are you that medications you are taking will be bad for you if taken for a long time?	1	2	3	4

For each of these **PROBLEMS**, circle one number for **how much they bother you** on a scale of 1 to 5 where 1 = Not at all bothersome, and 5 = Extremely bothersome.

		Not at all bothersome				Extremely bothersome
25.	Seizures	1	2	3	4	5
26.	Memory difficulties	1	2	3	4	5
27.	Work limitations	1	2	3	4	5
28.	Social limitations	1	2	3	4	5
29.	Physical effects of antiepileptic medication	1	2	3	4	5
30.	Mental effects of antiepileptic medication	1	2	3	4	5

31. How good or bad do you think your health is? On the thermometer scale below, the best imaginable state of health is 10 and the worst imaginable state is 0. Please indicate how you feel about your health by circling one number on the scale. **Please consider your epilepsy as part of your health when you answer this question.**

(Circle one number on the scale below)



Best Imaginable Health State

Worst Imaginable Health State

Annexure – XIV

Quality of Life in Epilepsy for Adolescents: QOLIE-AD-48 (Version 1)

Today's Date ___/___/___

Name _____
:

INSTRUCTIONS

The QOLIE-AD-48 is a survey of health-related quality of life for adolescents (11-18 years of age) with epilepsy. Adults (18 years or older) should complete the QOLIE-31-P, designed for that age group. This questionnaire should be completed only by the person who has epilepsy (not a relative or friend) because no one else knows how YOU feel.

There are 48 questions (in two parts) about your health and daily activities. Answer every question by circling the appropriate number (1, 2, 3...). The first part asks about your general health. The second part asks about the effects of your epilepsy and antiepileptic medications. **Please answer every question** by circling the appropriate number (1, 2, 3, 4, 5). If you are not sure about how to answer a question, please give the **best answer you can**. You may write notes in the margin to explain your feelings. Even if some questions look similar, answer every question.

If you are unsure about how to answer a question, please give the best answer you can and write a comment or explanation on the side of the page. These notes may be useful if you discuss the QOLIE-AD-48 with your doctor. Completing the QOLIE-AD-48 before and after treatment changes may help you and your doctor understand how the changes have affected your life.

This copy of the QOLIE-AD-48 is provided by www.epilepsy.com, your source for epilepsy information, and the QOLIE Development Group. We wish you success in living your life with epilepsy!

PART 1: GENERAL HEALTH

1. In general, would you say your health is: *(Circle one number)*

Excellent	Very good	Good	Fair	Poor
5	4	3	2	1

2. **Compared to 1 year ago,** how would you rate your health in general **now?**

Much better now	Somewhat better now	About the same now	Somewhat worse now	Much worse now
5	4	3	2	1

The following questions are about activities you might do during a TYPICAL DAY. We want you to answer how much **your health** limits you in these activities. *(Circle one number on each line)*

In the past 4 weeks, how often has your health limited:	Very often	Often	Some-times	Not often	Never
3. Heavy activities, such as running, participating in very active sports (such as gymnastics, rollerblading, skiing)?	1	2	3	4	5
4. Moderate activities (such as walking to school, bicycle riding)?	1	2	3	4	5
5. Light activities (such as carrying packages or a school bag full of books)?	1	2	3	4	5
6. Other daily activities (such as taking a bath/shower alone, going to and from school alone)?	1	2	3	4	5

The following questions are about your regular daily activities, such as chores at home, baby-sitting, attending school, being with friends and family, doing homework, or taking part in after-school activities and lessons. We want to know if you had any of the following difficulties with your regular activities as a result of any **physical problems (such as illness) or emotional problems (such as feeling sad or nervous)?**

In the past 4 weeks, how often have physical or emotional problems caused you to:	Very often	Often	Some-times	Not often	Never
7. Do fewer things than you would have liked to do?	1	2	3	4	5
8. Limit the ***kind*** of schoolwork, chores, sports, or other activities you did?	1	2	3	4	5
9. Have ***difficulty*** performing the schoolwork, chores, sports, or other activities you did (for example, it took extra effort) ?	1	2	3	4	5

In the past 4 weeks, how often:	Very often	Often	Some-times	Not often	Never

10. Did you skip school for no reason?	1	2	3	4	5
11. Were you in trouble in school (with teachers or other staff)?	1	2	3	4	5

	Very often	Often	Some-times	Not often	Never
12. Were you in trouble out of school (with police, security guards, bus driver, etc)?	1	2	3	4	5

These questions are about how you FEEL and how things have been for you during **the past 4 weeks.** For each question, please indicate the one answer that comes closest to the way you have been feeling. *(Circle one number on each line)*

In the past 4 weeks, how often have you:	All of the time	Most of the time	Some of the time	A little of the time	None of the time
13. Had trouble concentrating on an activity?	1	2	3	4	5
14. Had trouble concentrating on reading?	1	2	3	4	5

The following questions are about mental activities and language problems that may interfere with your normal schoolwork or living activities. *(Circle one number on each line)*

past 4 weeks, how often have you:	All of the time	Most of the time	Some of the time	A little of the time	None of the timeInthe
15. Had difficulty thinking?	1	2	3	4	5
16. Had difficulty figuring out and solving problems (such as making plans, making decisions, learning new things)?	1	2	3	4	5
17. Had a problem with complicated projects					

that require organization or planning like computer games or difficult homework)?	1	2	3	4	5
18. Had trouble remembering things you read hours or days before?	1	2	3	4	5
19. Had trouble finding the correct word?	1	2	3	4	5
20. Had trouble understanding your teachers?	1	2	3	4	5
21. Had trouble understanding what you read?	1	2	3	4	5

The following questions ask about the support you get from others (including family and friends).

(Circle one number on each line)

In the past 4 weeks, how often did you:	Very Often	Often	Some-times	Not often	Never
22. Have someone available to help you if you needed and wanted help?	5	4	3	2	1
23. Have someone you could confide in or talk to about things that were troubling you?	5	4	3		
24. Have someone you could talk to when you were confused and needed to sort things out?	5	4	3	2	1
25. Have someone who accepted you as you were, both your good points and bad points?	5	4	3	2	1

PART 2: EFFECTS OF EPILEPSY AND ANTIEPILEPSY MEDICATIONS

The following questions ask about how your epilepsy or medications (antiepileptic drugs) have affected your life in the past 4 weeks. *(Circle one number on each line)*

In the past 4 weeks, how often did you:	Very Often	Often	Some-times	Not often	Never
26. Feel that **epilepsy or medications** limited your social activities (such as hanging out with friends, doing extra-curricular activities)compared with social activities of others your age?	1	2	3	4	5
27. Feel alone and isolated from others because of your epilepsy/seizures ?	1	2	3	4	5
28. Miss classes because of seizures or medications?	1	2	3	4	5
29. Use epilepsy or medication side effects as an excuse to avoid doing something you didn't really want to do?	1	2	3	4	5
30. Feel embarrassed or "different" because you had to take medications?	1	2	3	4	5
31. Feel that epilepsy or medications limited your school performance?	1	2	3	4	5
32. Feel you had limitations because of your seizures?	1	2	3	4	5
33. Feel that epilepsy or medications limited your independence?	1	2	3	4	5

34. Feel that epilepsy or medications limited your social life or dating?	1	2	3	4	5

35. Feel that epilepsy or medications limited your participation in sports or physical activities?	1	2	3	4	5

The following question asks about possible side effects from antiepileptic drugs.
(Circle one number on each line)

In the past 4 weeks, how did you feel:	Very Bad	Bad	OK	Good	Very good
36. About how you looked (side effects such as weight gain, acne/pimples, hair change, etc.)?	1	2	3	4	5

In the past 4 weeks, how much were you bothered by:	A Lot	Some	Not much	A little	Not at all
37. Limits set by parents/family because of your epilepsy or medications?	1	2	3	4	5

Next are some statements people with epilepsy sometimes make about themselves. For each statement, circle the answer that comes closest to the way **you** have felt about **yourself** in the **past 4 weeks.** *(Circle one number on each line)*

	Strongly agree	Agree	Disagree	Strongly disagree
38. I consider myself to be less than perfect because I have epilepsy.	1	2	3	4
39. If I applied for a job, and someone else also applied who didn't have epilepsy, the employer should hire the other person.	1	2	3	4

40. I can understand why someone wouldn't want

to date me because I have epilepsy.	1	2	3	4
41. I don't blame people for being afraid of me because I have epilepsy.	1	2	3	4
42. I don't blame people for taking my opinions less seriously than they would if I didn't have epilepsy.	1	2	3	4
43. I feel that my epilepsy makes me mentally unstable	1	2	3	4

The following questions ask about your attitudes toward epilepsy. Circle one number for how often in the **past 4 weeks** you have had these attitudes. *(Circle one number on each line)*

	Very bad	A little bad	Not sure	A little good	Very good
44. How good or bad has it been that you have epilepsy?	1	2	3	4	5

	Very Unfair	A little unfair	Not sure	A little fair	Very fair
45. How fair has it been that you have epilepsy?	1	2	3	4	5

	Very sad	A little sad	Not sure	A little happy	Very happy
46. How happy or sad has it been					

for you to have epilepsy?	1	2	3	4	5

	Very bad	A little bad	Not sure	A little good	Very good
47. How bad or good have you felt it is to have epilepsy?	1	2	3	4	5

	Very often	Often	Some-times	Not often	Never
48. How often do you feel that your epilepsy kept you from starting new things?	1	2	3	4	5

Optional Items:

In the past 4 weeks, how often did you:	Very often	Often	Some-times	Not often	Never
Worry about having another seizure?	1	2	3	4	5
Fear dying because of seizures?	1	2	3	4	5
Worry about hurting yourself during a seizure?	1	2	3	4	5

Please check all pages before stopping to be sure that you have answered all the questions.

This copy of the QOLIE-AD-48 is provided by www.epilepsy.com, your source for epilepsy information, and the QOLIE Development Group. We wish you success in living your life with epilepsy!

Annexure XV

Dayanand Medical College & Hospital, Ludhiana.

DIVISION OF NEUROLOGY

SEIZURE DIARY

Year_____

Name _____ Age & Sex _____

Diagnosis _____ Consultant _____

Last Seizure _____

	JAN.	FEB.	MAR.	APR.	MAY.	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
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21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												

Drugs 1
2
3
4

Weight_____(Kg).

Seizures may be indicated by dots.

X

Annexure XVI

Epilepsy Self Management

Instructions: The following statements describe what people do to manage their epilepsy. Please circle one number for each statement to show how often you do the following. As you answer the questions, please think about your activities in the past year.

	Never	Rarely	Sometimes	Most of the Time	Always
IM 1. I write down how often I have seizures and when they occur.	1	2	3	4	5
LM 2. I do things such as relaxation, guided imagery, and self hypnosis to manage stress.	1	2	3	4	5
IM 3. I call my doctor when I think I am having side effects from my seizure medication.	1	2	3	4	5
*MM 4. When my seizure medication is running out, I spread out the time between doses.	1	2	3	4	5
IM 5. I keep a record of the types of seizures I have.	1	2	3	4	5
*SM 6. I stay out late at night.	1	2	3	4	5
IM 7. I keep track of the side effects of my seizure medication.	1	2	3	4	5

***MM 8. When my seizure medication is**	**1**	**2**	**3**	**4**	**5**
running out, I take less medication at each					
time.					
MM 9. I take my seizure medication the	**1**	**2**	**3**	**4**	**5**
way my doctor orders it.					
SeM 10. I stay out of situations that might	**1**	**2**	**3**	**4**	**5**
cause a seizure.					
SeM 11. If I am going away from home, I	**1**	**2**	**3**	**4**	**5**
take my seizure medication with me.					
SeM 12. I call my doctor if I am having	**1**	**2**	**3**	**4**	**5**
more seizures than usual.					
LM 13.I make sure I get enough sleep.	**1**	**2**	**3**	**4**	**5**

	Never	**Rarely**	**Sometimes**	**Most of**	**Always**
				the	
				Time	
LM 14. I do things that I enjoy to help	**1**	**2**	**3**	**4**	**5**
manage stress.					
SeM 15. I have a way to remind myself to	**1**	**2**	**3**	**4**	**5**
take my seizure medication.					
MM 16. I take my seizure medication at	**1**	**2**	**3**	**4**	**5**
the same time each day.					
***SM 17. I would go swimming alone.**	**1**	**2**	**3**	**4**	**5**
LM. 18. I do things such as relaxation,	**1**	**2**	**3**	**4**	**5**

guided imagery, and self hypnosis to keep					
myself from having a seizure.					
SeM 19. When the doctor orders blood	**1**	**2**	**3**	**4**	**5**
tests, I have them done.					
	1	**2**	**3**	**4**	**5**
IM 20. I wear or carry information stating					
that I have epilepsy.					
***MM 21. I have to put off having my**	**1**	**2**	**3**	**4**	**5**
seizure medication refilled because it costs					
too much money.					
LM. 22. I get enough exercise.	**1**	**2**	**3**	**4**	**5**
***SM. 23. I use power tools such as electric**	**1**	**2**	**3**	**4**	**5**
saws, electric hedge trimmers, or electric					
knives without an automatic shutoff.					
	1	**2**	**3**	**4**	**5**
***MM 24. I miss doctor or clinic**					
appointments.					
***MM 25. If I had side effects from the**	**1**	**2**	**3**	**4**	**5**
seizure medications, I would skip a dose					
without asking my doctor.					
SM 26. I take showers instead of baths.	**1**	**2**	**3**	**4**	**5**
MM 27. I plan ahead and have my seizure	**1**	**2**	**3**	**4**	**5**
medication refilled before I run out.					

	Never	Rarely	Sometimes	Most of	Always
				the	
				Time	
*MM 28. I miss doses of my seizure	1	2	3	4	5
medication because I do not remember to					
take it.					
	1	2	3	4	5
SM 29. I keep the temperature of the water					
in my home low enough so I do not get					
burned.					
*MM 30. I skip doses of seizure	1	2	3	4	5
medication.					
	1	2	3	4	5
SM 31. I check with my doctor before					
taking other medicines.					
	1	2	3	4	5
SeM 32. I stay away from things that make					
me have seizures.					
LM. 33. I eat regular meals.	1	2	3	4	5
*SM 34. I climb objects such as high	1	2	3	4	5
stools, chairs, or ladders.					
IM 35. I talk with other people who have	1	2	3	4	5
epilepsy.					
*SM 36. I drink a lot of alcoholic	1	2	3	4	5

beverages such as beer, wine, and whiskey.					
IM 37. I participate in a support group for	**1**	**2**	**3**	**4**	**5**
persons with epilepsy.					
IM 38. I practice what to do during a	**1**	**2**	**3**	**4**	**5**
seizure with my family and friends.					

Subscales:

MM=Medication management

IM=Information management

SM=Safety management

SeM=Seizure management

LM=Lifestyle management

*** Reverse code**

The Epilepsy Self-Management Scale (ESMS) is a 38 item scale that assesses frequency of use of epilepsy self-management practices. Each item is rated on a 5-point scale ranging from 1, never, to 5, always. The 26 original items were categorized into three areas: a) medication-related, b) safety-related, and c) general lifestyle management. Total scores are found by reverse coding the 12 negatively worded items and summing responses to all 38 individual items. Total possible scores range from 38-190 with higher scores indicating more frequent use of self-management strategies.

Annexure-XVII

CASE REPORT FORM
STUDY TITLE **Towards Developing a National Epilepsy Control Program :A Pilot Community-Based of Delivery if Care to People with Epilepsy**

Clinical Trial Site	Dayanand Medical College & Hospital, Ludhiana
Principal Investigator	Dr. Gagandeep Singh

Subject Initials				

Subject Randomization No.				

INCLUSION CRITERIA	Yes	No
A history of one or more epileptic seizures		
Subject willingly given written informed consent		

EXCLUSION CRITERIA	Yes	No
Subject having inactive epilepsy		
Subject having febrile seizures		
Subject having non-epileptic seizure		
Pregnancy as determined by the urine pregnancy test		
Medical Contraindication to MRI(pace-maker, implant)		
No history of progressive neurological deficit		
Unwillingness to provide informed consent		

Screening Visit

Date of Birth |__|___|___| Gender : M |__| F|__|

MM DD YYYY

Weight : |___|kg

Race ☐ Punjabi ☐ Bengali

☐ Tamilian ☐ Keralite

☐ Gujarati

Formal Education

☐ Above matric ☐Matric ☐ Below Matric ☐No Schooling

1. Has the patient signed written Informed Consent for this study

☐ Yes ☐ No

2. Date of Informed Consent | | | | | | | | | |

D D MM M Y Y Y Y

Blood Pressure: |__|__|__| / |__|__|__| mmHg Pulse: |__|__|__| beats/min

Temperature: |__|__|. |__| °C

I. History of Seizures:

1. Duration of Seizures : _____days DD Month Year

2. Type of Seizure Date of Seizure: |_|_|_|_|_|_|_|_|
   - Simple Partial ☐
   - Complex Partial ☐
   - Secondarily Generalized ☐
   - Generalized Tonic Clonic ☐
3. No. of Seizures :

   _____

II. Any History of Fever/ Headache/ Other/ Focal Neurological deficit(Weakness of one side/ Numbness of one side/ Vision loss in one side:

_____

_____

_____

III. Etiologic history

H/o febrile seizures

Birth History

Trauma

CNS Infections

IV. Concomitant medication Yes ☐ No ☐

PREVIOUS MEDICAL HISTORY

Is there any relevant medical history in the following systems?

Code	System	*Yes	No	Code	System	*Yes	No
1	Cardiovascular			9	Neoplasia		
2	Respiratory			10	Neurological		
3	Hepato-biliary			11	Psychological		
4	Gastro-intestinal			12	Immunological		
5	Genito-urinary			13	Dermatological		
6	Endocrine			14	Allergies		
7	Haematological			15	Eyes, ear, nose, throat		
8	Musculo-skeletal			00	Other		

Screening Investigations

1. EEG

_____

_____

_____

2. MRI Brain

_____

_____

_____

_____

3. Urine Pregnancy Test

Positive |__|

Negative |__|

4. Neuropsychology

5. Other Investigations

6. Final Diagnosis

Concomitant Medication

Medication	Total Daily Dose	Units	Reason	Start Date *(MM/DD/YYYY)*	Stop Date *(MM/DD/YYYY)*	Continuing
				__ __/__ __/__ __ __ __	__ __/__ __/__ __ __ __	☐
				__ __/__ __/__ __ __ __	__ __/__ __/__ __ __ __	☐
				__ __/__ __/__ __ __ __	__ __/__ __/__ __ __ __	☐
				__ __/__ __/__ __ __ __	__ __/__ __/__ __ __ __	☐
				__ __/__ __/__ __ __ __	__ __/__ __/__ __ __ __	☐
				__ __/__ __/__ __ __ __	__ __/__ __/__ __ __ __	☐
				__ __/__ __/__ __ __ __	__ __/__ __/__ __ __ __	☐
				__ __/__ __/__ __ __ __	__ __/__ __/__ __ __ __	☐
				__ __/__ __/__ __ __ __	__ __/__ __/__ __ __ __	☐

End of Visit Checklist: to be completed by Investigator

		Yes		No
1	Does the subject satisfy the inclusion and exclusion criteria to date?			
2	Have all screening procedures been completed?			

3	Has the concomitant medication page been completed?			
4	Is the subject willing to proceed?			

Follow- Up Visit

Screening ID: | _ | _ | _ | _ |

Date: |__|__|____| **Subject Initial:** |__|__|__|

MM DD YYYY

1. No. of pills taken
2. No. of pills missed
3. AED blood level

   Name of AED _____ Serum level _____ µg/ml

4. Any Adverse event since last visit
5. No. of seizures occurred since last visit

ANNEXURE XVIII

ਪੰਜਾਬ ਸਰਕਾਰ
ਸਿਹਤ ਤੇ ਪਰਿਵਾਰ ਭਲਾਈ ਵਿਭਾਗ
(ਸਿਹਤ - 4 ਸ਼ਾਖਾ)

ਸੇਵਾ ਵਿਖੇ

ਸਿਵਲ ਸਰਜਨ,
ਲੁਧਿਆਣਾ।

ਮੀਮੋ ਨੰ: 5/44/2014-5ਸਿ4/ 1675
ਮਿਤੀ, ਚੰਡੀਗੜ੍ਹ: 17.10.2014

ਵਿਸ਼ਾ:- Ad hoc Project, Id no. 2013-0324, entitled "Towards Developing a National Health Epilepsy Control Program" - Regarding.

***

ਉਪਰੋਕਤ ਵਿਸੇ ਦੇ ਸਬੰਧ ਵਿਚ।

2. ਵਿਸੇ ਸਬੰਧੀ ਇਕ ਪੱਤਰ ਮਿਤੀ 18.9.2014 ਸਮੇਤ ਤਜਵੀਜ ਡਾ: ਗਗਨਦੀਪ ਸਿੰਘ, ਪ੍ਰੋਫੈਸਰ ਅਤੇ ਮੁੱਖੀ, ਨੈਰੋਲੋਜੀ ਵਿਭਾਗ, ਡੀ.ਐਮ.ਸੀ. ਅਤੇ ਹਸਪਤਾਲ, ਲੁਧਿਆਣਾ ਤੋਂ ਵੀ ਸਰਕਾਰ ਨੂੰ ਪ੍ਰਾਪਤ ਹੋਇਆ ਸੀ, ਜਿਸ ਨੂੰ ਵਾਚਣ ਉਪਰੰਤ ਮਾਨਯੋਗ ਪ੍ਰਮੁੱਖ ਸਕੱਤਰ, ਸਿਹਤ ਤੇ ਪਰਿਵਾਰ ਭਲਾਈ ਜੀ ਨੇ ਹੇਠ ਲਿਖੇ ਅਨੁਸਾਰ ਹੁਕਮ ਕੀਤੇ ਹਨ:-

"Good proposal. Dr. Gagandeep Singh has done good research work in collaboration with PGI earlier. CS Ldh has supported. We may agree to support."

ਇਸ ਲਈ ਆਪਨੂੰ ਕਿਹਾ ਜਾਂਦਾ ਹੈ ਕਿ ਡਾਕਟਰ ਗਗਨਦੀਪ ਸਿੰਘ ਦੇ ਪ੍ਰੋਗਰਾਮ ਨੂੰ ਪੂਰਾ ਸਹਿਯੋਗ (support) ਕੀਤਾ ਜਾਵੇ।

ਸੁਪਰਡੰਟ

ਪਿ:ਅੰ:ਨੰ: 5/44/2014-5ਸਿ4/ 1676 ਮਿਤੀ, ਚੰਡੀਗੜ੍ਹ: 17.10.2014

ਉਪਰੋਕਤ ਦਾ ਇਕ ਉਤਾਰਾ ਡਾ: ਗਗਨਦੀਪ ਸਿੰਘ, ਪ੍ਰੋਫੈਸਰ ਅਤੇ ਮੁੱਖੀ, ਨੈਰੋਲੋਜੀ ਵਿਭਾਗ, ਡੀ.ਐਮ.ਸੀ. ਅਤੇ ਹਸਪਤਾਲ, ਲੁਧਿਆਣਾ ਨੂੰ ਸੂਚਨਾ ਤੇ ਲੋੜੀਂਦੀ ਕਾਰਵਾਈ ਹਿੱਤ ਭੇਜਿਆ ਜਾਂਦਾ ਹੈ।

ਸੁਪਰਡੰਟ

ANNEXURE XIX

ਨੰ: ਸ਼ਟੈਨੋ-14/ 2319 ਮਿਤੀ 11-11-14.
ਵਲੋ

ਸਿਵਲ ਸਰਜਨ,ਲੁਧਿਆਣਾ।

ਸੇਵਾਵਿਖੇ

ਡਾ: ਜਗਦੀਪ ਸਿੰਘ ,
ਪ੍ਰੋਫੈਸਰ ਅਤੇ ਮੁਖੀ ਨੈਫਰੋਲੋਜੀ ਵਿਭਾਗ,
ਦਿਆ ਨੰਦ ਮੈਡੀਕਲ ਕਾਲਜ ਅਤੇ ਹਸਪਤਾਲ,
ਲੁਧਿਆਣਾ।

ਵਿਸ਼ਾ: ਐਡਹਾਕ ਪਰੋਜੈਕਟ ਆਈ.ਡੀ. ਨੰ: 2013-0324 , ਐਨਟਾਈਟਲਡ ਡਿਵੈਲਪਮੈਂਟ ਏ ਲੈਬਾਰਟਰੀ ਹੈਲਥ ਐਪਲੀਕੇਸ਼ਨਜ਼ ਕੰਟਰੋਲ ਪ੍ਰੋਗਰਾਮ ਬਾਰੇ।

ਹਵਾਲਾ ਪੰਜਾਬਸਰਕਾਰ ਦੇਪੱਤਰ ਨੰ: 5/44-5ਸ਼ਸ4/1675 ਮਿਤੀ ਚੰਡੀਗੜ੍ਹ 17-10-14 ਉਪਰੋਕਤ ਵਿਸ਼ੇ ਦੇ ਸਬੰਧ ਵਿਚ।

ਮਾਨਯੋਗ ਪ੍ਰਮੁੱਖ ਸਕੱਤਰ,ਸਿਹਤਅਤੇ ਪਰਿਵਾਰ ਭਲਾਈ ਵਿਭਾਗ,ਪੰਜਾਬ ਸਰਕਾਰ ਤੋ ਉਪਰੋਕਤ ਵਿਸ਼ੇਬਾਰੇ ਗਈ ਤਜਵੀਜ਼ ਵਿਚਮੁਢਲਾ ਸਹਿਯੋਗ ਦੇਣ ਦੇ ਆਦੇਸ਼ ਪ੍ਰਾਪਤ ਹੋ ਚੁਕੇ ਹਨ ।ਇਸ ਲਈ ਉਪਰੋਕਤਜ਼ਰੂਰਤਾਂ ਵਾਲੇ ਵੇਰਵੇ ਸਹਿਤ ਜਾਣਕਾਰੀਭੇਜਦੇ ਹੋਏ ਜੋ ਸਹਿਯੋਗ ਦੀ ਜ਼ਰੂਰਤ ਹੈ ਬਾਰੇ ਦਸਦਿਤਾ ਜਾਵੇ ਅਤੇ ਤਾਂ ਜੋ ਵਿਭਾਗ ਵਲੋ ਬਣਦਾ ਸਹਿਯੋਗ ਦਿੱਤਾ ਜਾ ਸਕੇ।

ਸਿਵਲ ਸਰਜਨ,ਲੁਧਿਆਣਾ।

ਪ੍ਰਤਿਅੰਕਣ ਨੰ: ਸ਼ਟੈਨੋ-14/ ਮਿਤੀ

ਉਤਾਰਾ:

1. ਮਾਨਯੋਗ ਪ੍ਰਮੁੱਖ ਸਕੱਤਰ, ਪੰਜਾਬ ਸਰਕਾਰ, ਸਿਹਤ ਅਤੇ ਪਰਿਵਾਰ ਭਲਾਈ ਵਿਭਾਗ, ਚੰਡੀਗੜ੍ਹ ਜੀਨੂੰ ਉਨ੍ਹਾਂ ਦੇ ਹਵਾਲਾ ਅਧੀਨ ਪੱਤਰ ਦੇ ਸਬੰਧ ਵਿਚ ਸੂਚਨਾ ਹਿਤ ਭੇਜਿਆ ਜਾਂਦਾ ਹੈ ਜੀ।

ਸਿਵਲ ਸਰਜਨ,ਲੁਧਿਆਣਾ।

ANNEXURE XX

DAYANAND MEDICAL COLLEGE & HOSPITAL
LUDHIANA

Institutional Ethics Committee (DTEC)

Ref No.DMCH/DTEC/2013/ 429

Date: 26/10/13

Dr Gagandeep Singh
Professor & Head,
Deptt. of Neurology,
DMCH, Ludhiana

Ref.: "Towards developing a national epilepsy control program: A Pilot, community-based, randomized trial of delivery of care to people with epilepsy (PWE)

Subject: Ethics Committee Conditional Approval

Dear Dr. Gagandeep,

The Drug Trial Ethics Committee reviewed, discussed & conditional approved your project documents submitted with respect to the above referenced clinical trial in meeting held on **12-10-2013** at **02:00** pm in **Conference Room**, Research & Development Centre, DMC & Hospital, Ludhiana.

The following members of the Institutional Ethics Committee were present/voted in the meeting held on 12-10-2013 and were involved in the approval process

Sr. no	Members	Designation
1.	Dr. S C Chopra	Chairperson
2.	Dr. Sandeep Kaushal	Member Secretary
3.	Dr. Anurag Chaudhary	Joint Secretary, Member
4.	Dr. Puneet Aulakh Pooni	Member
5.	Dr. H S Pannu	Member
6.	Dr. Shalini Arora	Member
7.	Mr. S.S Saini	Member
8.	Adv. A K Jindal	Member
9.	Prof. Arvind Malhotra	Member
10.	Mrs. Bharti Satija	Member

Principal : 0161 4687501
Vice Principal : 0161 4687502
Medical Supdt. : 0161 4687504
Dean Academics : 0161 4687503

EPABX : 0161 4687777, Ext 7395
Fax : 0161 2302620
Email : dmchldh@glide.net.in
Website : www.dmch.edu
DTEC Office: 2304282-86, Extn: 607 (HDHI)
Email: dmciec@gmail.com
DTEC Fax : 0161-2409836

DAYANAND MEDICAL COLLEGE & HOSPITAL
LUDHIANA

Institutional Ethics Committee (DTEC)

Ref No.DMCH/DTEC/2013/429

Date: 26/10/13

Decision: The DTEC **conditionally approved** the project documents from the Ethics point of view to be conducted in its presented form at DMCH under your direction. Dr. Anurag Chaudhary did not participate in the voting process being a part of the study, rest all of the voting members present evaluated & discussed project's documents and concluded that the project is **conditionally approved.**

Subject to: 1) Submission of CTRI Number.

It is hereby confirmed that neither you nor any of the study team members have participated in the voting/decision making procedures of the committee.

The Drug Trial Ethics Committee should be informed

1. About the progress of the study.
2. Any Serious Adverse Events occurring in the course of the study within 7 calendar days of their occurrence.
3. Any changes in ICF and other documents.
4. Protocol Deviation(s).
5. Any change in the protocol and patient information/informed consent documents, prior to their implementation.
6. Final report of the study shall be submitted to Ethics Committee in all cases, even when the study is abandoned for any reason(s).
7. Inform DTEC in case of any change of study procedure, site and investigator. This permission is only for period mentioned above. Annual report to be submitted to DTEC.
8. Members of DTEC have right to monitor the trial with prior intimation

With regards,

Dr. Sandeep Kaushal

Chairman
Drug Trial Ethics Committee
DMC & H, Ludhiana.

Principal : 0161 4687501
Vice Principal : 0161 4687502
Medical Supdt. : 0161 4687504
Dean Academics : 0161 4687503

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Section C

Principal Investigator **Dr. Gagandeep Singh**

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Electronic mail:	gagandeep_si@yahoo.co.uk
Punjab Medical Council Registration No: Date of Birth	25278 22 September 1965

Educational Qualifications

Degree	Institution	Field(s)	Year
MBBS	Christian Medical College, Ludhiana, India	-	1982-1987

MD	Christian Medical College, Ludhiana, India	Internal Medicine	1989-1991
DM	Postgraduate Institute of Medical Education and Research, Chandigarh, India	Neurology	1992-1994

Research/ Training Experience

Duration	**Institution**	**Particulars of work done**
1990-1990	Punjab University, Chandigarh	Pyrexia of unknown origin: A clinical study

Research Specialization:

- Epilepsy
- Cystecercosis

Important recent Publications:

1. Singh G, Tally A.B Review in Neurology. Neurogentices and Neurommunology. India Academy of Neurology 2009

2. Singh G. Management of medical co-morbidity associated with epilepsy. Shorvon S, Perucca E, Engel J. Jr. The treatment of epilepsy 3rd Edition, PP 268-279. Philadelphia, Wiley-Blackwell, 2009.

3. Singh G. Other central nervous system infections and status epilepticus. Epilepsia. 2009; 50 (suppl)12:67-9.

4. Burneo JG, Del Brutto O, Delgado-Escueta AV, Gonzalez AE, Medina MT, Montano SM, Moyano LM, Nash T, Roman G, Singh G, White AC Jr, Wiebe S, Garcia HH. Workshop report: Developing an international collaborative research network in neurocysticercosis and epilepsy. Epilepsia. 2009 May; 50 (5): 1289-1290.

5. Singh G, Khurana D. Neurology of acute organophosphate poisoning. Neurology India 2009;57:119-125.

6. Singh G, Fletcher O, Bell GS, McLean AE, Sander JW. Cancer mortality amongst people with epilepsy: a study of two cohorts with severe and presumed milder epilepsy. Epilepsy Res. 2009 Feb; 83(2-3): 190-7.

7. Singh G. Sinha S. Infections of the central nervous system. In Panayiotopoulos CP. Atlas of epilepsies. 2010, Springer.

8. Singh G., Rajshekhar V, Murthy JM, Prabhakar S, Modi M, Khandelwal N, Garcia HH. A diagnostic and therapeutic scheme for a solitary cysticercus granuloma. Neurology. 2010; 75 : 2236-45.

9. Singh G, Khadilkar S. Reviews in Neurology. Controversies in Neurology. Indian Academy of Neurology 2010.

10. Khadilkar S, Singh G. Reviews in Neurology. Advances in Therapeutics in Neurology. Indian Academy of Neurology 2011.

11. Modi M, Singh G. Other parasitic diseases. In: Shorvon S, Andermann F, Guerrini R. The causes of epilepsy. Cambridge University Press. 2011: 501-510.

12. Singh G. Do no harm –but first we need to know more: the case of adverse drug reactions with antiepileptic drugs. Neurology India . 2011;59:53-8

13. Singh G, Burneo J.G., Sander J.W. Neurocysticercosis: Stars in the sky, seizures and substrates. Epilepsia. (accepted)

14. Singh G, Das S.K. Reviews in Neurology. Critical Care Neurology. Indian Academy of Neurology 2012.

15. Singh G. Murthy JMK, Radhakrishnan, A. Epilepsies due to brain injury, cerebrovascular disease central nervous system infections and brain tumours. In:

Shorvon S, Guerrini R, Cook M, Lhatoo S (eds.). Oxford Textbook of Epilepsy and Epileptic Seizures. 2012: 221-237

16. Singh G, Bawa J, Chinna D, Chaudhary A, Saggar K, Modi M, Sander J.W. Association Between Epilepsy Cysticercosis and Toxocariasis: A Population-Based Case-Control Study in An Urban Slum in India. Epilepsia 2012;53:2203-2208.

17. Otte WM, Singla M, Sander JW, Singh G. Drug therapy for solitary cysticercosis granuloma: a systematic review and meta-analysis. Neurology. 2013;80:152-162.

Financial support received

1. From ICMR

· Hospital based epidemiology of Taeniasis / Cysticercosis in India. Indian Council of Medical Research (2002-2004).

· Neurology of celiac disease: a hospital based study of celiac disease and prevalence of celiac disease in epilepsy. Protocol no. 5/4/3-3/07-NCD-II. Indian Council of Medical Research (2009-2011)

· Association between Toxocara canis and epilepsy: a collaborative, twin community prevalence and hospital–based incidence case-control study. Protocol No. 5/4-5/19/ Neuro/2008-NCD-I. Indian Council of Medical Research (2010-2011).

2. From other sources

• Cysticercus immunoblot assay in Indian patients with SSECT lesions and multilesional neurocysticercosis. Funded by the XIV World Congress of Neurology (India) Trust (1996-1999)

I certify that there is no conflict of interest with any financial organization regarding the material discussed in the protocol.

Co-Investigator ***Jatinder Singh Goraya***

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Punjab Medical Council Registration No:	26629
Date of Birth	10 March 1966

Educational Qualifications

Degree	Institution	Field(s)	Year
MBBS	Dayanand Medical College, Ludhiana, India	-	1985-1990
MD	Dayanand Medical College, Ludhiana, India	Paediatrics	1991-1993
Fellowship in Child Neurology	St. Christopher's Hospital for Children, Philadelphia, USA	-	2006-2009
FRCP	St. Christopher's Hospital for Children, Philadelphia, USA	-	2011

Research/ Training Experience

Duration	**Institution**	**Particulars of work done**
2000-01	PD Hinduja Hospital, Mumbai	Indian Journal of Pediatrics Research Fellowship
2008-09	Recipient of National Residency Scholarship Program (US)	Recipient of National Residency Scholarship Program (US)
2002-03	Royal College of Pediatrics & Child Health, UK	Visiting Fellowship

Research Specialization:

- Epilepsy
- Cystecercosis

Important recent Publications:

1. Co-authored a chapter, "Acute Encephalopathy in a Child" in a book entitled ***Neuroscience for The Primary Care Physician***. Book has recently been published by American Academy of Pediatrics, 2009.

2. **Goraya JS,** Cruz M, Valencia I et al. Sleep study abnormalities in children with attention-deficit hyperactivity disorders. **Pediatr Neurol** 2009; 40: 42-46.

3. **Goraya JS,** Marks H, Khurana DS et al. Subacute sclerosing panencephalitis (SSPE) presenting as acute disseminated encephalomyelitis in a child. **J Child Neuro** 2009; 24: 899-903.

4. JS Goraya. ***Controversies in the management of neonatal seizures***. In: Reviews in Neurology. Indian Academy of Neurology 2010

5. **Goraya JS**. A patient with chorea. Case presented at Movement Disorders-2010 Educational Course, held at DMCH, January 30-31st, 2010.

6. Singh P, **Goraya JS**, Gupta K, et al. MRI findings in Reye syndrome. Case report and review of literature. J Child Neurol 2011; 26: 1009-1014

7. Singh P, **Goraya JS**, Ahluwalia A, Saggar K. Glutaric aciduria type-1(glutaryl-CoA dehydrogenase deficiency). Neurology 2011; 77:e6

8. Massey SL, Buland Justin, Hauber S, Piatt Jr. J, **Goraya JS**, et al. Acute VI nerve palsy in a 4 year-old girl with Chiari I malformation and pontomedullary extension of syringomyelia: case report and review of the literature. Eur J Pediatr Neurol 2011; 15: 303-309

9. Farooque P, **Goraya JS,** Valencia I et al. Early-onset childhood absence epilepsy-Is it a distinct entity? Epileptic Disorders 2011; 13: 411-6

10. **Goraya JS**. A study of etiology and seizure outcome in infantile spasms. Poster presented at Annual conference of Neurology Chapter of IAP, September 8-9, 2011

11. Singh P, **Goraya JS,** Saggar K, Ahluwalia R. Aicardi syndrome – Report of a case with literature review. Singapore Medical Journal 2012;53: e153-155

Financial support received

1.From ICMR

NIL

2.From other sources

NIL

I certify that there is no conflict of interest with any financial organization regarding the material discussed in the protocol.

Co-Investigator ***Dr. Anurag Chaudhary***

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Designation	M.D. (Community Medicine) Professor and Head Department of Community Medicine Dayanand Medical College & Hospital Ludhiana. India.
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Electronic mail:	dr_anurag_choudhary@dmch.edu

Educational Qualifications

Degree	Institution	Field(s)	Year
MBBS	Lala Lajpat Rai Memorial Medical College, Meerut, UP	-	1988 – 1993
MD	Government Medical College, Amritsar, Punjab, India	Community Medicine	1996-1999

Research/ Training Experience

Duration	Institution	Particulars of work done
3 years	Guru Nanak Dev Hospital & a private facility in Amritsar	A retrospective study of risk factors of coronary artery disease in patients admitted in Guru Nanak Dev Hospital & a private facility in Amritsar

Research Specialization:

- Family Medicine
- Medical Education

Important recent Publications:

1. **Anurag Chaudhary**, Mahesh Satija, Tarundeep Singh, RK Soni, Sarit Sharma, Sangeeta Girdhar, RK Sachar. Trend and Patterns of Fertility over five years in a Rural area of Ludhiana, Punjab. Indian J Preventive & Social Medicine 2009; 40(3&4):168-71.

2. **Anurag Chaudhary,** Sangeeta Girdhar, RK Soni, "Epidemiological Correlates of Domestic Violence in Married Women in an Urban area of Ludhiana, Punjab: Internet Journal of Health volume 9 No. 1.2009
3. Sangeeta Girdhar, **Anurag Chaudhary,** PJS Gill, R K Soni, R K Sachar, " Contraceptive Practices and related factors among Married Women in a Rural Area of Ludhiana" : The internet journal of Health, 2010, volume-12, no.1.

4. **Anurag Chaudhary,** Sarit Sharma, Sangeeta Girdhar, Mahesh Satija. Duplicate publications: Time to Ring Alarm Bells. Indian J Community Med 2010; 35(1):199-200.

5. **Anurag Chaudhary,** Mahesh Satija, Sarit Sharma, GPI Singh, R K Soni, R K Sachar**.** Awareness and perceptions of school children about Female Feticide in Urban Ludhiana. Indian J Community Med 2010; 35(2):302-4.

6. **Anurag Chaudhary,** Health of Middle Aged Women: Neglect / Select for action. Indian J Maternal and Child Health 2011;13(3):1-5.

7. **Anurag Chaudhary**: Students feedback in improving learning in Community Medicine. Paper presented at Sixth Congress of the Asian Medical Education Association (AMEA 2011) 23rd -26th March, International Medical University, Kuala Lumpur, Malaysia

8. Gagandeep Singh, Jasleena Bawa, Deepinder Chima, **Anurag Chaudhary,** Kavita Saggar, Manish Modi, Josemir W. Sander, " Association between Epilepsy and Cystecercosis and Toxocariasis" : A population –based case- control study in India, Epilepsia, 1-6,2012

Financial support received

1. From ICMR

· Appointed as Co-Investigator in ICMR project "Association between Toxocara Canis and Epilepsy: A Collaborative, Twin (Community Prevalence and Hospital Based Incidence) case-control study).

· Appointed as guide for award of short-term studentship for year 2008 by **Indian Council of Medical Research** for a project entitled "Socio demographic Profile and Stated Health Issues of Immigrant Domestic Maid Servants in Urban Ludhiana (Punjab)."

2.From other sources

NIL

I certify that there is no conflict of interest with any financial organization regarding the material discussed in the protocol.

Co-Investigator *R K Setia*

Name	R K Setia
Designation	Scientist SD , Punjab Remote Sensing Centre, Ludhiana, India
Complete Postal Address:	Punjab Remote Sensing Centre, PAU Campus, Ludhiana-141 004, Punjab, India
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	+91 9646105308
Electronic mail:	setiark@gmail.com
Date of Birth	30-06-1978

Educational Qualifications

Degree	Institution	Field(s)	Year
M Sc	Punjab Agricultural University, Ludhiana	Soil Science	2002
Ph D	The University of Adelaide, Australia	Remote Sensing, GIS and Soil Carbon	2011

Research/ Training Experience

Duration	Institution	Particulars of work done
2011-13	The University of Adelaide, Australia	Carbon modelling using Remote Sensing and GIS
2004- Current	Punjab Remote Sensing Centre, Ludhiana	Working on various projects related to natural resource management using Remote Sensing and GIS

Research Specialization:

- Agriculture and Environmental Sciences
- Remote Sensing and GIS

Important recent Publications:

1. Khurana M P S, Kansal B D and **Setia R** (2014). Long-term impact of irrigation with sewage water on cadmium concentration in soils and crops. Agrochimica (Accepted)

2. Singh, K V, **Setia R**, Sahoo S, Prasad A and Paeriya B (2014). Evaluation of NDWI and MNDWI for real time assessment of waterlogging by integrating digital elevation model and ground water level. Geocarto International http://dx.doi.org/10.1080/10106049.2014.965757

3. **Setia R** , Lewis M, Marschner P, Raja Segaran R, Summers D and Chittleborough D (2013). Severity of salinity accurately detected and classified on a paddock scale with high resolution multispectral satellite imagery. Land Degradation & Development. **24**, 375-384

4. **Setia R** , Rengasamy P and Marschner P (2013). Effect of mono- and divalent cations on sorption of water-extractable organic carbon and microbial activity. Biology and Fertility of Soils. DOI 10.1007/s00374-013-0888-1

5. **Setia R**, Rengasamy P and Marschner P (2013). Effect of exchangeable cation concentration on sorption and desorption of dissolved organic carbon in saline soils. Science of the Total Environment **465**,226–232

6. **Setia R** and Marschner P (2013). Impact of total water potential and varying contribution of matric and osmotic potential on carbon utilization in saline soils. European Journal of Soil Biology **56**, 95-100

7. **Setia R** , Gottschalk P, Smith P, Marschner P, Baldock J, Setia D and Smith J (2013). Soil salinity decreased global soil organic carbon stocks. Science of the Total Environment **465**, 267-72

8. **Setia R** , Smith P, Marschner P, Gottschalk P, Baldock J, Verma V, Setia D and Smith J (2012). Simulation of salinity effects on soil organic carbon: past, present and future carbon stocks. Environmental Science and Technology **46**, 1624-1631

9. Wang Y, Hasbullah, **Setia R** , Marschner P and Zhang F (2012) Potential soil P mobilisation capacity– method development and comparison of rhizosphere soil from different crops. Plant and Soil **354**, 259-267

10. **Setia R** , Verma S and Marschner P (2012). Measuring microbial biomass carbon by direct extraction- Comparison with chloroform fumigation-extraction. European Journal of Soil Biology **53**, 103-106

11. **Setia R** and Marschner P (2012). Carbon mineralization in saline soils as affected by residue composition and water potential. Biology and Fertility of Soils **49**, 71-77

12. **Setia R**, Smith P, Marschner P, Baldock J, Chittleborough D and Smith J (2011)**.** Introducing a decomposition rate modifier in the Rothamsted carbon model to predict soil organic carbon stocks in saline soil**s.** Environmental Science and Technology **45, 6396-6403**

13. Setia R, Marschner P, Baldock J, Chittleborough D, Smith P and Smith J (2011). Salinity effects on carbon mineralization in soils of varying texture. Soil Biology and Biochemistry 43, 1908-1916

14. Setia R , Marschner P, Baldock J, Chittleborough D and Verma V (2011). Relationships between carbon dioxide emission and soil properties in salt affected landscapes. Soil Biology and Biochemistry 43, 667-674

15. Setia R , Setia D, Marschner P (2011). Short-term carbon mineralization in saline-sodic soils. Biology and Fertility of Soils 48, 475-479

16. Chowdhury N, Nakatani A, Setia R and Marschner P (2011). Microbial activity and community composition in saline and non-saline soils exposed to multiple drying and rewetting events. Plant and Soil 348, 103-113

17. Setia R , Marschner P, Baldock J and Chittleborough D (2010). Is CO2 evolution in saline soils affected by an osmotic effect and calcium carbonate? Biology and Fertility of Soils 46, 781-92.

18. Setia R , Sharma KN, Marschner P and Singh H (2009) Changes in nitrogen, phosphorus and potassium in a long-term continuous maize–wheat cropping system in India. Communications in Soil Science and Plant Analysis 40, 3348-3366.

Financial support received

1. From ICMR
   NIL

2. From other sources

Project Leader of

1. Organic carbon turnover in salt-affected soils of the Indo-Gangetic plains of India (funded by National Remote Sensing Agency, Hyderabad)

2. Mapping Punjab's Future (funded by Govt of Punjab, India)

I certify that there is no conflict of interest with any financial organization regarding the material discussed in the protocol.

Co-Investigator *Dr. Sarit Sharma*

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Punjab Medical Council Registration No:	29670
Date of Birth	02 September 1973

Educational Qualifications

Degree	Institution	Field(s)	Year
MBBS	G.G.S. Medical College, Faridkot	-	1991-1996
MD	Government Medical College, Patiala, Punjab, India	Community Medicine	2000-2003

Research/ Training Experience

Duration	**Institution**	**Particulars of work done**
1 year	DMC & Hospital, Ludhiana as a part of Project for PG Diploma in Hospital Management from NIHFW, New Delhi	Hand hygiene compliance in the ICUs of a tertiary care hospital.
1 year	Detroit Medical Center and Wayne State University, Detroit, MI, USA	Fellowship in Infection Control, Hospital Epidemiology and Antimicrobial Stewardship

Research Specialization:

- Epidemiology (Communicable & Non-communicable diseases)
- Infection Control and Hospital Epidemiology

Important recent Publications:

1. Bishav Mohan, Naved Aslam, Upma Ralhan, **Sarit Sharma**, Naveen Gupta, Vivudh Pratap Singh, Shibba Takkar, G.S. Wander. Office blood pressure measurement practices among community health providers (medical and paramedical) in northern district of India. Indian Heart J 2014; 66: 401–407.

2. Sandeep Kaur, Anurag Bhai Patidar, Meenakshi, **Sarit Sharma**, Navneet. Domestic Violence and Its Contributory Factors among Married Women in selected slums of Ludhiana, Punjab. Nursing and Midwifery Research Journal, 2014:10(1):30-35.

3. Mohan B, Chhabra ST, Aslam N, Wander GS, Sood NK, Verma S, Mehra AK, **Sharma S**. Mechanical breakdown and thrombolysis in subacute massive pulmonary embolism: A prospective trial. *World J Cardiol* 2013; 5(5): 141-147.

4. Namita Dang, Vibha Babbar, **Sarit Sharma**, Rita Rai. Dental caries and discoloration of teeth in Thalessemic patients: A case control study. Indian J Maternal and Child Health 2012;14(2):1-8.

5. **Sarit Sharma**, Shruti Sharma, Sandeep Puri, Jagdeep Whig. Hand hygiene compliance in the ICUs of a tertiary care hospital. Indian J Community Med 2011;36(3):217-21.

6. Rita Rai, Vibha Babbar, **Sarit Sharma**, B. Mohan, Namita Budhiraja. Dental Health Status in Children with Congenital Heart Disease: A Case Control Study. Indian J Maternal and Child Health 2011;13(4):1-7.

7. Abhimanyu Beri, Bishav Mohan, **Sarit Sharma**, Naveen Gupta, Shruti Sharma. Travel concerns for congestive heart failure (CHF) patients. The Internet Journal of Health 2010; 11(1).

8. Sood A, Midha V, Mehta V, **Sharma S**, Mittal R, Thara A, Sood N, Kaur A. How sustained is sustained viral response in patients with hepatitis C virus infection? Indian J Gastroenterol 2010;29(3):112-5.

9. Rita Rai, Bishav Mohan, Ashima Mahajan, **Sarit Sharma**. Oral health status of cardiac patients- a case control study. I Dentistry The Journal 2010; 6(4):9-14.

10. **Sarit Sharma**, Shruti Sharma, RK Sachar. H1N1 influenza and pregnancy. Indian J Maternal and Child Health 2010;12(3):1-13.

11. Shruti Sharma, **Sarit Sharma**, Sunita Goel, Gautam PL. Challenging Cases of Postpartum Haemorrhage (PPH) Presenting to a Tertiary Hospital-Two Case Reports. Indian J Maternal and Child Health 2010;12(4):1-7.

12. Shruti Sharma, **Sarit Sharma**, Shuchita Garg, Ashima Taneja, Sandeep Puri. Course and Outcome of Critically ill Obstetric Patients in the ICUs of a Tertiary Care Hospital in North India. Indian J Maternal & Child Health 2010; 12(1):1-5.

13. **Sarit Sharma**, Mahesh Satija, RK Sachar, RK Soni, GPI Singh. Perinatal Mortality in Multiple Pregnancy in a Rural Area of Punjab. Indian J Maternal & Child Health 2010; 12(1):1-11.

14. Anurag Chaudhary, **Sarit Sharma**, Sangeeta Girdhar, Mahesh Satija. Duplicate publications: Time to Ring Alarm Bells. Indian J Community Med 2010; 35(1):199-200.

15. **Sarit Sharma**. Obesity-a global menace. Indian J Maternal and Child Health 2010;12(2):1-8.

16. Anurag Chaudhary, Mahesh Satija, **Sarit Sharma**, GPI Singh, R K Soni, R K Sachar. Awareness and perceptions of school children about Female Feticide in Urban Ludhiana. Indian J Community Med 2010;35(2):302-4.

17. Anurag Chaudhary, Mahesh Satija, Tarundeep Singh, RK Soni, **Sarit Sharma**, Sangeeta Girdhar, RK Sachar. Trend and Patterns of Fertility over five years in a Rural area of Ludhiana, Punjab. Indian J Preventive & Social Medicine 2009;40(3&4):168-71.

18. MCQs in Preventive and Social Medicine. GPI Singh & **Sarit Sharma**. Elsevier Publishers, 2008.

Financial support received

1. From ICMR

- Appointed as Co-Investigator in ICMR project 'Office blood pressure measurement practices among community health providers (medical and paramedical) in northern district of India.'

2.3.4. Appointed as guide for award of short-term studentship for year 2012 by **Indian Council of Medical Research** for a project entitled 'To study awareness regarding HIV/AIDS among adult patients attending OPD in a tertiary care hospital in Ludhiana, Punjab.'

2. From other sources

Project sponsored by State Health Society-RNTCP, Punjab titled 'To study the common factors related to the non-referral of pulmonary TB suspects to designated microscopy centers by registered private practitioners in five major cities of Punjab'.

I certify that there is no conflict of interest with any financial organization regarding the material discussed in the protocol.

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Educational Qualification

Degree	Institution	Field(s)	Year
PhD	University of Calcutta, India	Economics	2005

Research/ Training Experience

Duration	**Institution**	**Particulars of work done**
June 2004 – August 2008	National Institute of Cholera and Enteric Diseases, Kolkata	Economist

August 2009 - July 2010	National Institute of Cholera and Enteric Diseases, Kolkata.	Senior Research Officer
August 2010 to June 2011	Resources for the Future (RFF) and Centre for Disease Dynamics, Economics & Policy (CDDEP), New Delhi.	Consultant

Research Specialization:

- Costing
- Cost-effectiveness studies
- Impact evaluations

Important recent Publications:

1. **Chatterjee S**; Laxminarayan R (2013). Costs of surgical procedures in Indian hospitals. ***BMJ Open.*** Vol. 3: e002844. doi: 10.1136/bmjopen-2013-002844.
2. **Chatterjee S**; Levin C; Laxminarayan R (2013). Unit cost of medical services at different hospitals in India. Vol. 8, No. 7: e69728. doi:10.1371/journal.pone.0069728.
3. Cook J; **Chatterjee S;** Sur D; Whittington, D (2012). Measuring risk attitudes among the urban poor in Kolkata, India. **Applied Economics Letters**. Vol. 20, No. 1, pp. 1 – 9.
4. **Chatterjee S;** Riewpaiboon A; Piyauthakit P; Riewpaiboon W; Boupaijit K; Panpuwong N et al (2011). Cost of diabetes and its complications in Thailand: a complete picture of economic burden. **Health and Social Care in the Community.** Vol. 19, No. 3, pp. 289 - 298.
5. **Chatterjee S;** Riewpaiboon A; Piyauthakit P; Riewpaiboon W (2011). Cost of informal care for diabetic patients at a public district hospital in Thailand. ***Primary Care Diabetes*.** Vol. 5, No. 2, pp. 109-115.
6. Riewpaiboon A; **Chatterjee S;** Piyauthakit P (2011). Cost Analysis for Efficient Management: a Case of Diabetes Treatment at a Public District Hospital in Thailand. **International Journal of Pharmacy Practice.** Vol. 19, No. 5, pp. 342 – 349.
7. Prinja S; Bahuguna P; Rudra S; Gupta I; Kaur M; Mahendale SM; **Chatterjee S;** Panda S; Kumar R (2011). Cost effectiveness of targeted HIV prevention interventions for female sex workers in India. ***Sextually Transmitted***

Infections. Vol. 87, No. 4, pp. 354 – 361.

8. Sur D; **Chatterjee S;** Riewpaiboon A; Manna B; Kanungo S; Bhattacharya SK (2009). Treatment cost of typhoid fever in two hospitals in Kolkata, India – **Journal of Health, Population and Nutrition**. Vol. 27, No. 6, pp. 725 – 732.
9. Whittington D; Sur D; Cook J; **Chatterjee S;** Maskery B; Lahiri M et al. (2009). Rethinking cholera and typhoid vaccination policies for the poor: private demand in Kolkata, India – ***World Development***. Vol. 37, No. 2, pp. 399 – 409.
10. Sur D; Cook J; **Chatterjee S;** Deen JL; Whittington D (2006). Increasing the transparency of stated choice studies for policy analysis: designing experiments to produce raw response graphs **Journal of Policy Analysis and Management,** Vol. 26, No. 1, pp. 189 – 199.

Financial support received

1. From ICMR

NIL

1. From other sources

NIL

I certify that there is no conflict of interest with any financial organization regarding the material discussed in the protocol.

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Educational Qualifications

Degree	Institution	Field(s)	Year
B.A.	Saint John's University, New York, USA	Economics.	1990-1994
M.Sc.	Cornell University, Ithaca, New York, USA	Economics of Development.	1995-1997
PhD	Johns Hopkins University, Baltimore, USA	Department of International Health, Health Systems Division.	2000-2004

Research/ Training Experience

Duration	Institution	Particulars of work done
2000-2004	Johns Hopkins University, Baltimore, USA	Health System and Program Evaluation
2007 - present	Public Health Foundation of India (PHFI) & Indian Institute of Public Health (IIPH-Delhi), New Delhi, India	Health systems, financing, and program evaluation

Research Specialization:

- Health economics and financing
- Health systems
- Health survey analysis
- Quantitative methods
- Economic evaluation

Important recent Publications:

1. Rao KD, Ramani S, Hazarika I, and George S. (2013). When do vertical programs strengthen health systems? A comparative assessment of disease specific interventions in India. Health Policy and Planning. doi:10.1093/heapol/czt035.

2. Rao KD, Sundararaman T, Bhatnagar A, Gupta G, Kokho P, and Jain K. (2013). Which doctor for primary health care? Quality of care and non-physician clinicians in India.

3. Social Science and Medicine. 84: 30-34.

4. Rao KD, Bhatnagar A, Berman P. (2012). So many, yet few: Human resources for health in India. Human Resources for Health. 13;10(1):19.

5. Sheikh K, Rajkumari B, Jain K, Rao KD, Patanwarb P, Gupta G, Antony KR, and Sundararaman T. (2012) Location and vocation: why some government doctors stay on in rural Chhattisgarh, India. International Health. doi:10.1016/j.inhe.2012.03.004

6. Shroff Z, Murthy S, Rao K. (2012). Attracting Doctors to Rural Areas: A Case Study of the Post-Graduate Seat Reservation Scheme in Andhra Pradesh. Indian Journal of Community Medicine. Forthcoming.

7. Huffman MD, Rao KD, Pichon-Riviere and others. (2011). A cross-sectional study of the microeconomic impact of cardiovascular disease hospitalization in four low- and middle- income countries. PLoS One. 6(6).

8. Rao M, Rao KD*, Kumar S and others. (2011). Health for all and the human resource crisis. Lancet. Vol 337, 9765:587-598.

9. Patel V, Kumar AKS, Paul VK, Rao KD, Reddy KS. (2011). Universal health care in India: the time is right. *The Lancet*. Vol. 377 No. 9764 pp 448-449

10. Rao KD*, Bhatnagar A and Murphy A. (2011). Socioeconomic Inequalities in the Prevalence, Treatment and Financing of Cardiovascular and Diabetes in India. Indian Journal of Medical Research.133, pp 57-63.

11. Sharawat R. and Rao KD*. 2011. (2011). Insured yet vulnerable: out-of-pocket payments and India's poor. Health Policy and Planning. Doi: 10.1093/heapol/czr029.

Financial support received

1. From ICMR

NIL

2.From other sources

NIL

I certify that there is no conflict of interest with any financial organization regarding the material discussed in the protocol.