1. **Work plan and methodology:**

Methods of this study will be as follows to fulfil the above mention objectives:

**Study design:** This study will be conducted as a case control survey of kala azar diagnosed patients at their home and two surrounding houses of diagnosed kala azar patient with age and sex match individuals considered as control in three endemic districts of Eastern Nepal.

**Study site:** Eastern Development Region (EDR) lies in the eastern most part of our country and consists of 3 zones namely Mechi, Koshi and Sagarmatha along with 16 districts namely Solukhumbu, Okhaldhunga, Khotang, Bhojpur, Udayapur, Siraha, Saptari, Morang, Dhankuta, Terathun, Panchthar, Tblejung, Sankhuwasava, Ilam and Jhapa. This development region consists of 14 municipalities. It has 5363395 (23.1 % of total) population and 28456 square kilometres area. It is the only region elevated from 60 meters to the summit of the world (Mt. Everest, 8848 meters). Mount Everest (sagarmatha) and other peaks such as Kanchenjung, Makalu, Lhotse etc. are in this region. Some major protected areas of here are Koshi Tappu wild life reserve, Kanchenjunga conservation area, Makalu Barun national park, Sagarmatha national park.

Like of other development region EDR also comprises up of 3 ecological belts namely Terai, Hill and Mountain. Terai is located at low altitude with plain and alluvial soil. It has hot type of climate with subtropical ever green forest. In the middle there lie the hilly region which is composed up of many up and downs, river basins, valley etc. it has moderate climate with deciduous forests. The nature of soil is sandy loam and gravelly. In the northern most part there lie mountain region with high snow capped mountains such as Mt. Everest, Makalu etc. it has cold climate throughout the year with coniferous forest. The nature of soil is rocky and gravelly. Morang and Jhapa are the major districts for Paddy production, Ilam for Maize production and Siraha, Saptari, Sunsari, Morang, Jhapa for wheat production. Jhapa and Ilam of this development region are very famous in the country and outside the country too. Gaighat, one of the famous religious places also lies here.

Whole the Eastern Development Region is drained by Sapta-koshi river system. It receives rainfall only in summer due to monsoon wind that comes from Bay of Bengal. Mechi, Kankai, Arun, Tamor are the major rivers of this region. Minerals like copper, lead, iron, mica, graphite are also found in this region. The airports of this development region are Bhojpur, Tplejung, Biratnagar, Rajbiraj airport. There are also some irrigation projects like Sunsari-Morang and Kankai irrigation project. Okhaldhunga, Bhojpur, Terathun, Gorkhe, Puwa Khola are the Hydro project power of this region.

There is a socio-cultural diversity in Eastern Development Region. There are also many religious and cultural places. Majority of inhabitant of terai belong to Indian origin people where they are Hindus. They grow paddy, wheat, maize as food crops and tea, tobacco, sugarcane as cash crops. Some people are involved in industrial sector. In hilly region majority of people belong to 4 cast group along with some
ethnic group such as Rai and Kiratis. They follow kirat religion. People of here are involved in slope farming along with animal husbandry. Tea is the major cash crop produced here. Some Rai and Limbu people are involved in British and Indian army. In mountain region majority of people are Sherpa’s who are export in mountaineering. They are Buddhists and follow Buddhism. Some other people are involved in animal husbandry due to the availability of pasture areas of high hills. Biratnagar of Morang and Dharan of Sunsari are the major industrial areas of this development region.

Although it is joined with Central Development Region to the west, China to the North and India to the east and south its development status is not so good. Besides, there are some problems for development of this region. The terai belt is almost all drown by the Koshi River System and many lives are in danger with great loss of property but the government is not serious in this issue. The country is known all over the world due to its natural beauty but due to the rapid deforestation the Hilly areas are being naked and are losing its identity. Many Youths of here are migrating abroad for employment due to the lack of employment opportunity here. Due to the lack of Infrastructure of development EDR is hindering from development.

The study will be conducted in randomly selected diagnosed cases of kala azar from municipalities and Village Development Committees (VDCs) of three endemic districts of Eastern Development Region of Nepal.

**Study duration:** The study will be conducted from January 2014 to June 2014.

**Study population:** All diagnosed kala azar patients of last two years from one referral centre for kala azar treatment and 3 zonal hospitals will be considered as study population as cases and nearby two persons age and gender matching of cases houses will be consider as control.

**Sample size:** Sample size will be considered 250 cases and 500 controls from endemic districts of eastern Nepal will be taken based on odds ratio of 1.81 of risk factors according to previous study\(^{18}\).

**Sampling procedure:** A listing of all the diagnosed cases of kala azar reported to BP Koirala Institute of Health Sciences Referral Hospital, Sagarmatha Zonal Hospital Rajbiraj, Koshi Zonal Hospital Biratnagar and Mechi Zonal Hospital Bhadrapur and Sunsari District Hospital Inaruwa will prepared. Out of these cases 250 will be selected randomly. For control age and sex matched controls from same municipalities and Village Development Committees (VDCs) area will be selected.

**Statistical Model:** Logistic regression model will be applied to find out the significant risk factors of kala azar in eastern Nepal.

**Research instruments and techniques:** A semi structured pre-tested questionnaire will be used. The questionnaire will be divided in six sections:

1. Socio demographics Characteristics
2. Pattern of bed net uses
3. Household and surrounding environment
4. Dependent variable: Case and control

**Validity and reliability of the study:**

- Pre-testing will be done among 100 of the sample size and necessary modification will be made accordingly before starting the study.
- Cross check of data will be done on the same day to limit error and inconsistencies of the data.
Variables under study

Dependent Variable:
Kala azar disease diagnosed last two years as cases and surrounding houses those have not kala azar diagnosed cases last two years as control.

Independent variable:
1. Socio demographics Characteristics
   a. Age
   b. Gender
   c. Religion
   d. Mother tongue
   e. Occupation
   f. Number in family
   g. Type of family
   h. Education
   i. Marital status
   j. Income of family

2. Pattern of bed net uses
   a. Use of bed net
   b. Sleeping place
   c. Sleeping floor
   d. Type of clothes of bed net

3. Household and surrounding environment
   a. Type of house
   b. Type of house wall
   c. Cleanness of house and surrounding area of house
   d. Storage pattern of fire wood
   e. Living type with livestock animals
   f. Type of latrine
   g. Water storage type
   h. Pond near house

4. Dependent variable: Case and control

Ethical consideration:
Before conducting the study, ethical clearance will be obtained from the authorized research committee. Before starting the interview; each respondent will be explained the purpose of the study and informed verbal consent will be obtained from each individual. Confidentiality of each respondent will be assured and maintained.

2. **Plan of Action:**

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