

## CHAPTER-3

# METHODOLOGY

The methodology relating to the current study on '**Inter-tribe variation in quality of life in The Nilgiris District of Tamil Nadu**' is discussed under the following heads:

- 3.1. Selection of the area;
- 3.2. Selection of the sample;
- 3.3. Collection of data;
- 3.4. Period of study;
- 3.5. Hypothesis formulated;
- 3.6. Concepts used;
- 3.7. Theoretical frame work and method of assessment of quality of life;
- 3.8. Quantitative tools used and;
- 3.9. Tabulation and analysis of data.

### **3.1 Selection of the area:**

The study was related to the Nilgiris District of Tamil Nadu since Nilgiris District occupies first rank in the proportion of scheduled tribe population (4.5 percent) to total District population (Primary Census Abstract of India, 2011). "Nilgiris" the name in Sanskrit means BLUE MOUNTAINS and in Tamil NEELAMALAI. The Nilgiris District is situated in the Western Ghats. It is surrounded by the Coimbatore District, Kerala State and Karnataka State on the eastern, western and the northern side respectively. The Nilgiris District is a celebrated summer resort for the tourists from all over India. Udhagamandalam popularly called, as Ooty is the Queen of hill stations in India. The economic activities of this District is accelerated by the visit of tourists to a considerable extent which increase the income capacity of the people.

## **Profile of the study area**

### **3.1.1. Geography and climate**

The Nilgiris District is situated in the elevation of 900 meters to 2636 meters above the mean sea level. It's latitudinal and longitudinal dimensions are 130 kilometers and 185 kilometers. The geographical area of the District is 2,543 square kilometers. About 60 per cent of the cultivable land falls under the slopes. High elevation of the District result in low temperature, which is further lowered by excessive moisture content of the atmosphere resulting from the exaltation by the vegetation. The temperature ranges from minimum 10 degree Celsius to 29.8 degree Celsius. The District enjoys both southwest monsoon and northeast monsoon. The normal annual rainfall ranges from 1500 mili meters to 3000 mili meters.

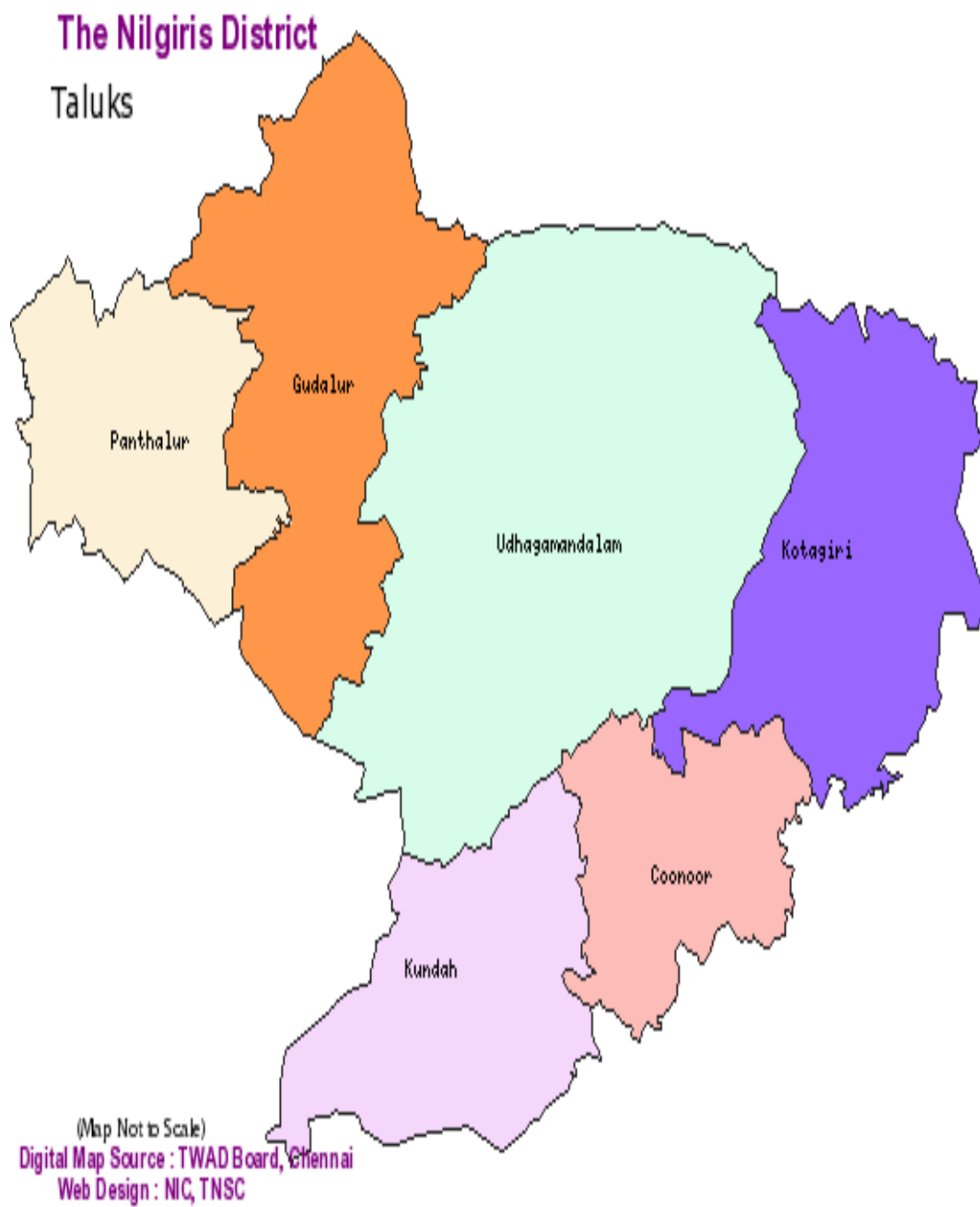
### **3.1.2. District administration**

The Nilgiris District consists of six taluks -namely Udhagamandalam, Coonoor, Kotagiri, Gudalur, Kundah and Pandalur. The up plateau at an altitude of 6,500 feet consists of three taluks namely Udhagamandalam, Coonoor and Kotagiri while Gudalur taluk is the oldest plateau at an altitude of 3,000 feet. There are four Panchayat Unions in the District. The four municipalities are Udhagamandalam, Coonoor, Gudalur and Nelliylam. There are 11 special village panchayats in the District and Wellington is the only contonment in the District.

Figure 1 represents the Nilgiris District map

**Figure 1**

**The Nilgiris District Map**



### **3.1.3. Population**

In 2011, The Nilgiris District had population of 7, 35,394 of which 3, 60,143 were males and 3, 75,251 were females. There were total 66,799 children under age of 0-6 and they formed 9.08 percent of the population of the District in 2011. Sex ratio stood at 1042 per 1000.

In 2011, of the total population, 59.24 percent lived in urban regions of the District. In total, 4,35,655 people lived in urban areas of which males were 2,14,234 and females were 2,21,421. However 40.76 percent population of the Nilgiris District lived in rural areas. In total, 2, 99,739 lived in rural areas of which males and females were 1,45,909 and 1,53,830 respectively. People of different religions such as Hindus, Christians, Muslims, Sikhs, Jains and Buddhists lived in the District. Of all the religions, Hindu population constituted 78.6 percent, Christians constituted 11.45 percent, Muslims constituted 9.54 percent and other religions accounted for 0.41 percent.

### **3.1.4. Education**

Total literates in The Nilgiris District were 569,647 of which males and females were 299,447 and 270,200 respectively. The average literacy rate of the District in 2011 was 85.20 percent and male and female literacy rates were 91.72 percent and 78.98 percent respectively. Nilgiris District had 100 middle schools, 188 high schools, 85 higher secondary schools and 6 colleges

### **3.1.5. Health infrastructure**

Nilgiris District had 28 primary health centres, 194 health sub-centres and 5 plague circles, 5 taluk hospitals and one District head quarters Government hospital.

### **3.2. Selection of the sample:**

The study adopted multistage stratified random sampling method and proportionate random sampling method.

In the first stage the taluks for the study were selected. Table 3 represents the taluk wise tribal population in Nilgiris District.

**Table 3**

### **Taluk wise tribal population in Nilgiris District**

S.no	Name of the taluk	Number of males	Number of females	Total	Proportion of scheduled tribes population to total population
1	Udhagamandalam	2462	2565	5027	2.4
2	Coonoor	1188	1165	2353	1.3
3	Kotagiri	3098	3143	6241	5.5
4	Gudalur	2593	2699	5292	5.4
5	Pandalur	4374	4483	6857	7.6
6	Kundah	299	304	603	1.2

**Source:** Tribes and inter ethnic relationship in Nilgiris District, Tamilnadu  
Tribal research centre, Ooty (2011)

The study was confined to Udhagamandalam, Coonoor, Kotagiri, Gudalur and Pandalur taluks. The Taluk Kundha was omitted for the study since it has the lowest tribal population and also due to inadequate transport facilities.

In the second stage, the households for the study were selected. By following proportionate random sampling (15 percent of the total number of households), the number of households in each tribal group were selected.

Table 4 represents the number of selected households in each tribal group.

**Table 4****Number of selected households in each tribal group**

S. no	Tribal groups	Name of the taluk	Total number of households	Number of sample tribal households	Area
1.	Todas	Udhagamandalam	314	47	Nanjanad Sholur
2.	Kotas	Kotagiri	574	86	Kotagiri Denadu
3.	Kurumbas	Gudalur	935	140	Devarsolai Masinagudi
4	Irulas	Coonoor	1605	240	Melur Hulical
5	Paniyans	Pandalur	2233	334	Nelliyalam Erumad
6	Kattunayakans	Pandalur	417	62	Cherangodu O' valley
	Total			909	

**Source:** Tribes and inter ethnic relationship in Nilgiri District, Tamil Nadu  
Tribal research centre, Ooty (2011)

As a whole the study covered the sample of 909 tribal households.

**3.3. Collection of data:**

The details relating to general information, family background, family income and expenditure, savings, borrowings, assets, educational status, health status, food intake, housing condition, problems faced and measures required were collected by administering an interview schedule to the head of the selected tribal households. (Appendix I)

### **3.4. Period of study**

The study was related to 2014-15. The pilot study was conducted in February 2014 to check the reliability and accuracy of data. Final data collection was done during March 2014- August 2014.

### **3.5. Hypothesis formulated**

- The socio economic status of different tribal groups do not differ;
- There is no significant association between attitude towards education and socio economic characteristics of the family of different tribal groups;
- The educational status of different tribal groups do not differ;
- The health status of different tribal groups do not differ;
- The social status, economic status, health status and housing condition do not have significant impact on quality of life of tribals;
- There exist no significant difference in quality of life index of different tribal groups;
- There is no link between quality of life and poverty of tribals and
- The problems faced by different tribal groups do not differ.

### **3.6. Concepts used**

#### **➤ Literacy rate**

Literacy rate is the percentage of people aged six and above who can read and write with understanding any language in relation to total population.

#### **➤ Gross enrolment ratio**

Gross enrolment ratio is defined as percentage of enrolment of particular age group children to the estimated child population in the respective age group (i.e) 6 to 11 years for class I to V standard and 11 to 14 years for class VI to VIII standard.

$$\text{Gross enrolment ratio} = \frac{\text{Number of children enrolled in a particular stage of education}}{\text{Number of children in the specific age group relevant to that stage of education}}$$

➤ **Dropout rate**

Dropout rate denotes the percentage of the number of children dropping out of the school education system in a particular year to total enrolment.

➤ **Per head educational expenditure**

Per head educational expenditure is obtained by dividing the total educational expenditure by the number of school/college going children in the households.

➤ **Health status**

Health status is a holistic concept that is determined by more than the presence or absence of any disease. It is often summarised by self-assessed health status.

➤ **Infant mortality rate**

Infant mortality rate is the number of death of children infants of less than one year of age per 1000 live births. It is defined as

$$\text{IMR} = \frac{\text{Number of death of infants in the age group of 0-12 months}}{\text{Total number of live births}} \times 1000$$

➤ **Kacha house**

Kacha house are made up of wood, mud, straw and dry leaves

➤ **Pucca house**

Pucca house is a strong house and it is made up of wood, bricks, cement, iron and steel. Flats and bungalows are pucca house and such house is called permanent house.

➤ **Semi pucca house**

A structure which cannot be classified as a pucca and katcha structure as per definition is a semi-pucca structure. Such a structure will have either the walls or the roof but not both.

➤ **Living area**

Living area is the sum of quantifiable ground area of rooms, which belong exclusively to the accommodation unit. The living area includes the space of living rooms, bed rooms, kitchen and adjoining rooms (hall, storerooms, bath and so on) with a clear height of at least two meters.

➤ **Poverty**

It is considered as a socio economic phenomenon whereby the resources available to a society are used to satisfy the wants of the few while many do not have even their basic needs met.

➤ **Multidimensional poverty index**

The multidimensional poverty index is an index designed to measure acute poverty. The MPI combines two key pieces of information to measure acute poverty: the incidence of poverty, or the proportion of people (within a given population) who experience multiple deprivations and the intensity of their deprivation - the average proportion of (weighted) deprivations they experience.

### **3.7. Theoretical frame work and method of assessment of quality of life**

Adam Smith was certain that wealth of the nation is what economic activity is after. In his view, wealth denotes the necessities and luxuries of life, i.e. flow of goods and services which the population could enjoy. A great change came about with the marginal utility school of the 1870s. It was assumed that it is not goods and services but their utility which people are after. Utility was however a subjective evaluation. As it was non-measurable, non-additive and non-comparable between persons, there was no bridge between individual utilities and collective utility.

The Keynesian macro approach which dominated economic thinking in the last forty years had no place for utility at all. Employment and income were the two variables that mattered. In national accounting which was developed under the impact of Keynes' theoretical thinking, the various subdivisions of the Gross National Product all expressed in monetary terms, were taken to be the final outcomes of economic activity and were assumed to express the well-being of population.

According to Joan Robinson, in today's economic theory we have no adequate way of assessing the final outcome of economic activity i.e. its impact on the conditions in which people live. To assess the conditions of a population, to determine what has been its progress over a period of time, to compare it with other populations, to

formulate policies and plans for its improvement, we have no applicable quantitative instruments apart from inadequate national accounting variables.

A similar difficulty arises at micro level. The cost benefit analysis or project analysis, suffers badly from lack of an unequivocal point of reference in the well-being of the population.

Hence there is a need for a construct, the maximisation of which would determine the optimal position of a national economy. Such a function would provide a focus to economic analysis by answering such questions as "what development is for" and would be relevant for assessing past performance and for drafting policies for the future. It would also be a step forward in the methodology of economics as it would imply the introduction of new analytical tools which would make equilibrium analysis more relevant.

In the set-up of economic theory, such a function would occupy the place which has been de facto vacated by utility and imperfectly filled by Gross National Product. Its numerical values must be derived from empirical observation and they must be comparable as between persons and populations and also in space and time. On the other hand, it must possess some of the features of utility. As it is supposed to reflect the well-being of the population, it cannot be conceived without a preference element being present in it.

It is proposed to call it "Quality of Life Function" (QLF). The term would reflect the assumption that the improvement in the quality of life of the population constitutes the ultimate aim of economic activity. It is also proposed that the variables of that function are expressed in terms of social indicators. It is possible to select such a set of indicators which would cover all the essential components of human welfare. Indicators included in that set would provide a numerical expression for the welfare of the population in question.

The differences between the classical utility or preference function and the quality of life function are significant. First the number of QLF variables is relatively small. When the classical preference function contains all commodities as variables, the QLF is limited to the set of indicators chosen. The classical preference function will not give any relevant information about real conditions of society as we cannot hope to obtain information about the multitude of goods that are supposed to constitute the variables of such a function. In the traditional function, the dependent variable expresses utility (non measurable) and the independent variable expresses quantities of various goods, the number of which is very great. In the QLF, the dependent variable is expressed in terms of Quality of Life Index and the independent variables are expressed in terms of social

indicators (their respective physical units). The number of variables is limited and all of them are measurable and observable.

### **3.7.1 The construction and determination of the quality of life function**

The first step in the construction of a quality of life function is the selection of its components and indicators. The selected set represents the concept of basic needs and environmental conditions peculiar to the population. It will be different for populations with various cultural backgrounds and at various levels of development. When a system of indicators is accepted it is possible to determine the numerical value of indicators for a given population.

Quality of Life Function must however contain explicit valuations. They are shown by the numerical values of the parameters of the function. They constitute weights for the function's independent variables and so they determine the relative impact of each variable on the value of the function i.e. on the quality of life as a whole. The determination of parameters makes the function complete, because numerical values have been determined for all its elements: The value of the dependent variable can be interpreted as quality of life index.

### Forms of quality of life function

The quality of life function may take different forms. For the purpose of theoretical reasoning, it may be conceived as being similar to the familiar preference function. It can be written as

$$Q = f(X_1, X_2, X_3, X_4, \dots, X_n)$$

where: Q is the Quality of Life Index

$X_1, X_2, X_3, X_4 \dots X_n$  are numerical values of social indicators referring to selected components of the quality of life.

For the purpose of empirical investigation which would lead to the computation of the numerical value of the function it is more practical to conceive the function as a linear one. Such a function can be written as

$$Q = a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + \dots + a_nx_n$$

where  $a_1, a_2, a_3, a_4, \dots, a_n$ , are parameters expressing respective weights assigned to particular variables.

### **3.7.2. Method of assessment of quality of life:**

#### **Parameters used for estimating the quality of life of selected tribal households:**

Following Dhanasekaran (1993) and Beck and Mishra (2010), the current study tried to assess quality of life of the selected tribal households by using the following parameters.

#### **Social status:**

1. Educational status

#### **Economic status:**

2. Occupational status
3. Monthly per capita income (in rupees)
4. Annual food expenditure as a percent of annual income
5. Annual clothing expenditure per person
6. Assets possessed (in rupees)
7. Vehicles possessed

#### **Nutrition status:**

8. Food intake

#### **Health status:**

9. Prevalence of disease
10. Source of water
11. Sanitation facilities
12. Fuel availability

#### **Housing:**

13. Type of house
14. Number of rooms per person
15. Living area per person (in square feet)

Table 5 represents the scores assigned for different parameters used in calculating quality of life index

**Table 5**

**Scores assigned for different parameters used in calculating quality of life index**

S. No	Scores Indicators	1	2	3	4	5	6	7	8	9	10
1.	Educational status	Illiterate	Primary	Secondary	Higher secondary	Polytechnic	Under graduation	Post graduation	Engineering	Medicine	PhD
2	Occupational status	Unemployed	Agricultural labourer	Marginal farmer and small farmer	Medium farmer	Large farmer	Hunter	Fishermen	Bee collection	Business	Organised sector employment
3	Monthly per capita income (in rupees)	Below 2000	2000-3000	3000-4000	4000-5000	5000-6000	6000-7000	7000-8000	8000-9000	9000-10000	Above 10000
4	Annual food expenditure as a percent of annual income	70-75	65-70	60-65	55-60	50-55	45-50	40-45	35-40	30-35	Below 30
5	Annual clothing expenditure per person (in rupees)	Below 100	100-200	200-300	300-400	400-500	500-600	600-700	700-800	800-900	Above 900
6	Assets possessed (in rupees)	Below 50000	50000-100000	100000-150000	150000-200000	200000-250000	250000-300000	300000-350000	350000-400000	400000-450000	Above 450000
7	Vehicles possessed	No vehicle	Cycle	TVS motors	Scooter	Bike	Auto	Mini tempo	Jeep	Tempo	Car
8	Food intake	Rice with onion	Rice with pulses	Rice with onion and pulses	Rice with pulses and green-leaf vegetables	Rice with pulses, green-leaf vegetables and milk	Rice with pulses, green- leaf vegetables milk and fruits	Rice with pulses, green-leaf vegetables and egg	Rice with pulses green-leaf vegetables, milk and egg	Rice with pulses, green- leaf vegetables, milk, fruits and egg	Rice with pulses, green- leaf vegetables, milk, fruits, egg, and meat

Cont...

S. No	Indicators	1	2	3	4	5	6	7	8	9	10
9	Prevalence of disease	Cancer	Jaundice	Cholera	Malaria	Asthma	Skin disease	Tuberculosis	Measles	Cold and fever	Cold and cough
10	Source of water	Common bore well	Common tube well	Public tap	Own bore well	Own tube well	Own bore well and tube well	Tank with pumping facilities	Through taps in bathroom	Through taps in Kitchen	Through taps in Kitchen and bath rooms
11	Sanitation facilities	No sanitation facilities	Pit	Open air	Public toilet	Own Indian toilet outside the house	Own western toilet outside the house	Own Indian and western toilet outside the house	Own Indian toilet inside the house	Own western toilet inside the house	Own Indian and western toilet inside the house
12	Fuel availability	Coal	Wood	Coal and wood	Kerosene	Coal and kerosene	LPG	LPG and kerosene	Electricity	LPG and electricity	Kerosene LPG and electricity
13	Type of house Roof (R) Wall (W) Floor (F)	Leaf (R) Leaf (W) Mud (F)	Leaf(R) Mud (W) Mud (F)	Asbestos sheet (R) Brick (W) Mud (F)	Tiles (R) Brick (W) Mud (F)	Tiles (R) Brick (W) Cement (F)	Tiles (R) Brick (W) Cement(F) without compound wall	Tiles (R) Brick (W) Cement -(F) with compound wall	Tiles (R) Brick (W) Marble (F) without compound wall	Tiles (R) Brick (W) Marble (F) with compound wall	Pucca house with terrace
14	Number of rooms per person	Below .20	.20-.40	.40-.60	.60-.80	.80-1	1-1.20	1.20-1.40	1.40-1.60	1.60-1.80	1.80-2
15	Living area (in square feet)	Below 50	50-100	100-150	150-200	200-250	250-300	300-350	350-400	400-450	Above 450

**Educational status:**

The educational status of all the members of the family have been recorded and scored. All the members of the family were assigned score individually and an average score was computed for each family. Those families with a mean score of below 3 are considered poor in their educational level, with a mean score of 5-6 as fair and the score of more than 6 are considered as good in their educational level.

**Occupational status:**

Occupational status was based on the score of 2 for agricultural labourers. Hunters were assigned the score of 6 and business people were assigned the score of 9.

**Monthly per capita income**

The per capita income of each family was calculated by taking the total income of the family and dividing it by total number of family members. Families with per capita income of Rs.2000 to Rs.3000 were categorised as poor, with per capita income of Rs.3001 to Rs.6000 as average, with per capita income of Rs.6001 to Rs.9000 as fair and per capita income of Rs. 9001 or more are considered as good.

**Food expenditure:**

Families with a score of 3 and below were considered as poor in the category of food expenditure, a score of 4 to 5 were in average category, score of 6 to 7 were in fair category and score of 8 or more were considered as good.

**Annual clothing expenditure:**

Clothing expenditure per head was estimated and score of 2 and below were considered as poor. The score of 3 to 4 were in average category, score of 5 to 6 were in fair category and score of 7 or more were considered as good.

**Assets possessed:**

The assets possessed by each family like land, house, jewels, consumer durables, vehicles etc were observed and the total value of all materials was calculated and on the basis of this estimation they were grouped and assigned with scores. Families with a score of 3 and below were considered as poor, the score of 4 to 5 were in average category, score of 6 to 7 were in fair category and score of 8 or more were considered as good.

**Vehicles possessed:**

On the basis of vehicles possessed, the families with a score of 3 and below were considered as poor, the score of 4 to 5 were in average category, score of 6 to 7 were in fair category and score of 8 or more were considered as good.

**Food intake:**

On the basis of food intake, the families with the score of 3 and below were considered as poor, the score of 4 to 5 were in average category, score 6 to 7 were in the fair category and score of 8 or more were considered as good.

**Prevalence of disease:**

Health status was analysed in terms of the incidence of disease. The families with the score of 3 and below were considered as poor, the score of 4-5 were in average category, score of 6-8 were in fair category and score of 9 or more were considered good.

**Source of water:**

If water especially used for drinking purpose has been collected from common tube well or bore well, the families were assigned score of 3 and below and they were considered as poor. Families the score of 4 to 5 were in average category, score of 6 to 7 were in fair category and score of 8 or more were considered as good.

**Sanitation facilities:**

With regard to sanitation facilities, the families with the score of 4 and below were considered as poor. Families with the score of 5 to 6 were in average category, the score of 7 were in fair category and the score of 8 and above were considered as good

**Fuel availability:**

The respondents were divided according to the use of fuel and assigned scores. Families with the score of 3 and below were considered as poor in the category of fuel availability, the score of 4 to 5 were in average category, score of 6 to 7 were in fair category and score of 8 or more were considered as good.

**Type of house:**

Mainly the type of houses can be categorised into three: pucca, semi pucca and kattcha. Taking the score into consideration the families were classified average, fair and good. Families with a score of 4 or 5 come under average category, score of 6 to 7 were considered fair and families with score of 8 or more were considered as good.

**Number of rooms per person:**

Families with a score of 4 and below were considered as poor in the category of number of rooms per person, the score of 5 to 6 were in average category, score of 7 to 8 were in fair category and score of 9 or more were considered as good.

**Living area:**

Families with a score of 3 and below were considered as poor in the category of living area, the score of 4 to 5 were in average category, score of 6 to 7 were in fair category and score of 8 or more were considered as good.

Each parameter was scored out of ten and hence the total score comes to 150. The minimum desired level of score for the above parameters for a fair living condition was defined on a scale of 0 to 150. All the parameters have been given an equal weightage and the total score of quality of life index was 150. The classification on the basis of the total score used for analysis is as follows

- Below 30 = Poor quality of life index
- 30-60 = Average quality of life index
- 60-90 = Fair quality of life index
- Above 90 = Good quality of life index

### 3.8. Quantitative tools used

#### ➤ Chi-square analysis

The study used chi square analysis to find out whether there is significant association between the attitude towards education and the selected socioeconomic characteristics of the tribal households. The formula used was

$$\chi^2 = \frac{\sum(O-E)^2}{E}$$

where,

O = Observed frequency and

E = Expected frequency

#### ➤ Construction of composite educational index

The current study tried to construct composite educational index for the selected tribal households based on literacy rate and gross enrolment ratio. As a first step, educational attainment index was calculated by the following formula

$$EAI = \frac{(\text{Actual literacy rate}) - (\text{Minimum literacy rate})}{(\text{Maximum literacy rate}) - (\text{Minimum literacy rate})}$$

The minimum and maximum values were fixed as 0 and 100 respectively

Similarly gross enrolment index for the tribal households was calculated as follows

$$\text{Gross enrolment index} = \frac{(\text{Actual gross enrolment ratio}) - (\text{Minimum gross enrolment ratio})}{(\text{Maximum gross enrolment ratio}) - (\text{Minimum gross enrolment ratio})}$$

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enrolment ratio)

Actual gross enrolment ratio was computed by adding up of the enrolment at different level of education. The minimum and maximum values were fixed as 0 and 100 respectively.

Following Nauriyal and Sahoo (2010) the current study tried to construct composite educational index as follows

$$\text{CEI} = \frac{2 * \text{literacy index} + \text{gross enrolment index}}{3}$$

The index varies from 0 to 1. The households with the score close to 1 is performing better.

➤ **Gender disparity index in enrolment**

Gender disparity index in enrolment was measured as a ratio of enrolment of boys in relation to enrolment of girls.

$$\text{Gender disparity index} = \frac{\text{Gross enrolment rate of boys}}{\text{Gross enrolment rate of girls}} * 100$$

➤ **Likert rating scale**

Likert rating scale was used to find out the attitude towards education. In the Likert scale the respondents were asked to respond to each of the statements in terms of five degrees of agreement to disagreement. Each point on the scale carries a score of 5 = Strongly agree, 4= Agree, 3= Neutral, 2= Disagree and 1= Strongly disagree.

➤ **Cronbach's Alpha**

Cronbach' Alpha is a measure of the extent to which all the variables in a scale is positively related to each factor.

The formula for Cronbach Alpha is

$$\lambda \text{ Standardized} = \frac{K \cdot r}{1 + (K-1)r}$$

where K is the number of variables and r is the average correlation among all pairs of variables. Cronbach Alpha value ranges from 0 to 1. The higher the score the more reliable the generated scale is. Nuttlay (1978) has indicated 0.7 to be the acceptable reliability coefficient. In the current study Cronbach Alpha was used to evaluate the uni dimensionality of scale items.

➤ **Gini co- efficient ratio**

The current study tried to estimate Gini co efficient ratio to find out the extent of variation in the selected variables- educational status, occupational status, monthly per capita income, annual food expenditure as a percent of annual income, annual clothing expenditure per person, assets possessed, vehicles possessed, food intake, prevalence of disease, source of water, sanitation facilities, fuel availability, type of house, number of rooms per person and living area per person among the selected tribal groups.

The formula used was

$$G = \frac{N+1}{N-1} - \frac{2}{N(N+1)U} \sum P_i X_i$$

where

P<sub>i</sub> = The rank assigned to the selected tribal households

X<sub>i</sub> = Actual value assigned to the selected tribal households

U = Actual value for the selected tribal households / Number of selected tribal households and

N = Number of selected tribal households.

➤ **Sopher's disparity index**

The disparity in quality of life had been estimated by using Sopher's (1974) disparity index. The index is written as below.

$$D = \log (X_2 / X_1) + (\log (Q - X_1) / (Q - X_2))^3$$

where  $X_1$  is the quality of life of the first tribal group and  $X_2$  is the quality of life of the second tribal group and  $Q > 200$ . The index as proposed by Sopher lacks in certain desirable properties. Indicating this, Kundu and Rao (2000) proposed  $Q = 200$  so that deficiencies are removed. The value of index ranges from 0 to 1. The lower value indicates lower disparity and higher value indicates higher disparity.

### ➤ **Analysis of variance**

Analysis of variance (ANOVA) is essentially a procedure for testing the difference among different groups of data for homogeneity. "The essence of ANOVA is that the total amount of variation in a set of data is broken down into two types- that amount which can be attributed to chance and that amount which can be attributed to specified causes. There may be variation between samples and also within sample items and ANOVA consists in splitting the variance for analytical purposes.

The basic principle of ANOVA is to test for differences among the means of the population by examining the amount of variation within each of these samples, relative to the amount of variation between the samples. In terms of variation within the given population, it is assumed that the values of  $X_{ij}$  differ from the mean of the population only because of random effects whereas in examining differences between populations it is assumed that the difference between the mean of the  $j$ th population and the grand mean is attributable to a 'specific factor'. Thus while using ANOVA, it is assumed that each of the samples is drawn from normal population and that each of these populations has the same variance.

$$F = \frac{\text{Estimate of population variance based on variance between samples}}{\text{Estimate of population variance based on variance within samples}}$$

The calculated value of F is to be compared to the F -limit for given degrees of freedom. If the F value is equal or exceeds the F- limit value, it is inferred that there are significant differences between the sample means.

In the current study ANOVA was used to find out whether there is significant difference in average quality of life index of different tribals groups.

### ➤ **Factor analysis**

Factor analysis attempts to identify underlying variables, or factors, that explain the pattern of correlations within a set of observed variables. Factor analysis is often used in data reduction to identify a small number of factors that explain most of the variance observed in a much larger number of manifest variables. Factor analysis can also be used to generate hypothesis regarding causal relationship between two more variables or to screen variables for subsequent analysis

The factor analysis are often used in exploratory data analysis to:

- Study the correlations among a large number of interrelated quantitative variables by grouping the variables into a few factors and
- Interpret each factor according to the meaning of the variables and summarize many variables by a few factors.

A factor is an underlying construct or dimension that represents a set of observed variables. Factor loading help in interpreting and labeling the factors. It measures how closely the variables in the factor are associated. Factor loadings are correlation coefficients between the variables and the factors. Eigen values measure the variance in all the variables corresponding to the factor. Eigen values are calculated by adding the squares of factor loading of all the variables in the factor. It helps in explaining the importance of the factor with respect to variables. Kaiser (1960) recommended retaining all factors with eigen values greater than 1.

### **KMO and Bartlett's Test**

Two tests namely, Kaiser-Meyer-Olkin measures of sampling adequacy (KMO) and Bartlett's Test of Sphericity have been applied to test whether the relationship among the variables has been significant or not.

### **Principal component:**

Communalities measure the percentage of variance in each variable explained by the factors extracted. It ranges from 0 to 1. A high communality value indicates that the maximum amount of the variance in the variable is explained by the factors extracted from the factor analysis.

In the principal components solution, all initial communalities are 1. There can be as many factors (principal components) as there are variables.

In the current study the factor analysis was applied to identify the factors influencing quality of life. The variables included in the study were educational status, occupational status, monthly per capita income, annual food expenditure as a percent of annual income, annual clothing expenditure per person, assets possessed, vehicles possessed, food intake, prevalence of disease, source of water, sanitation facilities, fuel availability, type of house, number of rooms per person and living area per person. For the factor analysis SPSS 16.0 version was used.

➤ **Multidimensional poverty index**

The current study tried to estimate multidimensional poverty index (introduced in Human Development Report 2010) based on the method followed by Sabina Alkire (2011) and Maria Emma Santos (2011).

Multidimensional poverty index (MPI) includes people living under conditions where they do not reach the minimum internationally agreed standards in indicators of basic functioning such as being well nourished, being educated or drinking clean water. Second, it refers to people living under conditions where they do not reach the minimum standards in several aspects at the same time. So each person is identified as deprived or not deprived using any available information for household members.

Three dimensions of poverty – education, health and living condition were analysed. MPI is estimated based on ten indicators- years of schooling, school attendance, nutrition, child mortality, cooking fuel, sanitation, water, electricity, floor and assets.

**Education** (each indicator is weighted equally at 1/6)

Years of schooling: deprived if no household member has completed five years of schooling

School attendance: deprived if any school-age child is not attending school in years 1 to 8

**Health** (each indicator is weighted equally at 1/6)

Child mortality: deprived if any child has died in the family

Nutrition: deprived if any adult or child is malnourished

**Living standard** (each indicator is weighted equally at 1/18)

Electricity: deprived if the household has no electricity

**Drinking water:** deprived if the household does not have access to clean drinking water or clean water is more than 30 minutes walk from home

**Sanitation:** deprived if the household lacks adequate sanitation or if their toilet is shared

**Flooring:** deprived if the household has a dirt, sand or dung floor

Cooking fuel: deprived if the household cooks with wood, charcoal or dung

**Asset ownership:** deprived if the household does not own more than one of: radio, T.V, telephone, bicycle, motorcycle, or refrigerator and does not own a car or tractor

A person is assigned a deprivation score according to his or her deprivations in the component indicators. The deprivation score of each person is calculated by taking a weighted sum of the number of deprivations, so that the deprivation score for each person lies between 0 and 1. The score increases as the number of deprivations of the person increases and reaches its maximum of 1 when the person is deprived in all component indicators. A person, who is not deprived in any indicator, receives a score equal to 0. The deprivation of each person is weighted by the indicator's weight. If the sum of the weighted deprivations is 33 per cent or more of possible deprivations, the person is considered to be multidimensionally poor.

MPI is a product of the incidence of poverty and intensity of poverty. The incidence of poverty is called the multidimensional headcount ratio (H): It is calculated as

$$H = \frac{q}{n}$$

where q is the number of people who are multidimensionally poor and n is the total population.

Intensity of poverty (A) is the average deprivation score of the multidimensionally poor people and is calculated as

$$A = \frac{\sum c_i(k)}{q}$$

where,  $c_i$  is the censored deprivation score of individual i and q is the number of people who are multidimensionally poor.

$$\text{MPI} = H \times A.$$

➤ **Rank correlation analysis:**

The study used rank correlation analysis to find out the nature of the relationship between the ranks assigned to the selected tribal households based on the of quality of life index and the ranks assigned to the selected tribal households based on the multidimensional poverty index . The rank correlation was calculated for different tribal groups. The formula used was

$$\rho = 1 - \frac{6\sum d_i^2}{n(n^2 - 1)}$$

where

n= Sample size

$d_i^2$  = Difference between ranks

➤ **Garrett's ranking technique**

Garrett's ranking technique was used to analyse the problems faced by the selected respondents. As per this method, respondents have been asked to assign the rank for problems and the outcomes of such ranking have been converted into score value with the help of the following formula:

$$\text{Percent position} = \frac{100(R_{ij} - 0.5)}{N_j}$$

where,

$R_{ij}$  = Rank given for the  $i$ th variable by  $j$ th respondent and  $N_j$  = Number of variables ranked by  $j$ th respondents. The percent position of rank obtained is converted into scores by referring to the table given by Henry. E. Garrett and Woods worth R.S. (1968). The scores of each individual were added and then total value of scores and mean values of score were calculated. The mean scores were arranged in descending order and the corresponding ranks were allotted.

➤ **Kruskal Wallis test:**

The Kruskal Wallis test is an analysis of variance that uses the ranks of the observation rather than the data themselves. Kruskal Wallis test is used for comparing the k populations, where n is greater than 2. The Kruskal Wallis test hypothesis test is

$H_0$ : All k populations have the same distribution

$H_1$ : Not all k populations have the same distribution

The assumption required for Kruskal Wallis test is that k samples are random and are independently drawn from the respective population.

All population in the entire set is ranked from the smallest to the largest,  $n_1$  is the sample size from population 1:  $n_2$  is the sample size from population 2 and so on up to  $n_k$  which is the sample size from population k. n is defined as the total sample size.

$$n = n_1 + n_2 + \dots + n_k$$

$R_1$  is the sum of the ranks of sample 1,  $R_2$  is the sum of the ranks of sample 2 and  $R_k$  is the sum of the ranks of sample k.

The Kruskal wallis test statistic is

$$H = \frac{12}{n(n+1)} \left[ \sum_{j=1}^k \frac{R_j^2}{n_j} \right] - 3(n+1)$$

The null hypothesis is rejected if the computed value exceeds the critical point of  $\chi^2$  (K-1) for a given level of significance.

In the current study, Kruskal wallis test was used to find out whether there is significant difference in the rank assigned for the problems faced by different tribal groups.

### **3.9. Tabulation and analysis of data:**

The collected data were tabulated and analysed in the following chapter on **'Results and Discussion'**

