Mixed Approach in Poverty Measurement: A Study of Tribal Communities

Ajay Kumar Salgotra[1]*, Prashant Kandari[2] and Pabitra kumar Jena[3]

[1]Lecturer, Udhampur Campus, University of Jammu, Udhampur, Jammu & Kashmir, India
[2]Assistant Professor, HNB Garhwal University, Srinagar(UK), India
[3]Assistant Professor, School of Economics, Shri Mata Vaishno Devi University, Katra, Jammu & Kashmir, India

Abstract: This paper is to investigate relationship and discrepancy between Income poverty and Multidimensional Poverty among tribal communities. Two approaches (income based approach and deprivation based approach) were used to estimate the incidence of poverty among tribal communities. The study found that there is little relation between the Income and multidimensional poverty variables but limited in nature. A conflict of 36.2 % found in the measurement of poverty by using both the approaches and this discrepancy is more in income based poverty as compare to multidimensional based. About accuracy of monetary measure is 63.7 % and the remaining percentage is not traced by this measure but traced by non monetary measure. The result of logistic regression revealed that income can significantly reduce the multidimensional poverty and its variables respectively.

Keywords: Poverty, Tribes, Tribal Communities, Income Poverty, Multidimensional Poverty, Poverty measurement, Jammu and Kashmir, India

INTRODUCTION

Poverty is a global issue and challenge for the policy makers to capture the accurate picture of poverty. Because, it's presence may constraints the economic growth and human development. However, there are two international approaches available for measurement of poverty. First is the poverty line which is based on income or consumption expenditure (World Bank) and second is based on deprivation know as Multidimensional poverty index given by United Nation Development Programme (UNDP).

Income poverty seems poverty as a result of inability of the individual or family to congregate their basic needs (World Bank, 2000). This measurement includes both food items as well as non food items like cloths, house, etc and put these needs together to obtain a income poverty line (Ravallion, 2012). World Bank define income poverty line is an assured level of income required to meet the basic needs of "shopping basket" (Shopping Basket is a combination of food items and non food items). According to World Bank, if a person earn less than 1.25 $ or 1.90 $ a day (PPP, 2011) is considered to be poor else not (World Bank, 2000). This measure is well-situated and straightforward to determine the poverty and to implement across the countries (Coromaldi and Zoli, 2012). Further, it also provides very useful information about the consumption pattern of the people's. That's why still most of the nations developed or developing nations like India consider and using income or consumption expenditure of the people's to measure the poverty (Santos and Alkire, 2011).

But from the last two decades, the debate is going on for different or alternative approach or methodology which is different from the income based approach to measure the true poverty. Sen (1992) rightly written in his book *"Inequality Re-*

examined" that poverty is not due to lack of income but it is deprivation in basic human capabilities. It refers deprivations in the basic capabilities of the individual or family and it includes illiteracy, malnutrition, persistent disease, actual living and empowerment, etc. These capabilities are important and fundamentally valuable. By enhancing these basic capabilities of poor people's through education and health care will improve their productivity and income (Sen 1999). Therefore, multidimensional poverty measurement based on basic capability can replicate the real circumstances of poverty more accurately, and the poverty should be treated as multidimensional (Alkire 2002, Alkire and Foster 2007 and 2011, Wang and Alkire 2009). These sorts of indication suggest that poverty is a multidimensional social phenomenon (Sen, 1997; Foster and Sen, 1997; and Lipton and Ravallion, 1995) and it includes many more things (like good health, education, etc) other than the income which can influence the society towards well being. Further, Sen said that good health and basic education make people easier to escape from the poverty and it also provides more meaningful lives and helps them to participate in social activities (Sen, 1999).

The available literature also argues that poverty experience various forms of deprivation, it include not only economic aspects but also social and environmental aspects (Coromaldi and Zoli, 2012). Santos stated that income is one of another dimension of multidimensional poverty (Santos, 2013). Thus, to find out poverty more properly it should be treated as a broader concept than the single dimensional (income only). Some studies also revealed that there is some relation between non monetary and monetary measure (Santos and Alkine, 2011; Akline, 2002; Alkine and Foster, 2007 and 2011; Wang and Alkire, 2009, Wang et.al, 2016). Wang et.al found in their study that there is a negative relationship between income and multidimensional poverty as the level of income increase it reduces the incidences of multidimensional poverty significantly but its impact is limited in nature because generally income influences the quality of life directly but due to market failure its influence or impact is not effective. The study also reported that income poverty hardly captures the complexity of poverty so that result of multidimensional poverty is important but cannot replace the income poverty. In the end, they advocated for the implementation of multidimensional poverty along with income poverty as a complementary measure to capture the poverty more accurately (Wang et. al, 2016). There are some other studies were also advocated the same thing as non-monetary indicators should be complementary to monetary ones in order to evaluating a poverty in a more better or relevant way (Townsend, 1979; Ringen, 1988; Nolan and Whelan, 1996; Perry 2002; Haughton and Khandker, 2009; Alkire and Santos (2010)).

The above discussion seize that there is some relation between monetary poverty and non monetary poverty and it is closely related to each other. This paper used both the approaches to see their relationship and difference between income and multidimensional poverty respectively in the newly created Union Tertiary (UT) of Jammu and Kashmir (J&K) of India. In the end this paper will also suggest a relevant suggestions for the policy makers through they can reduce poverty significantly.

The remainder of the paper is structured as fellows: Section 2 presents data source, method and model; Section 3 explains finding and discussion; Section 4 deals with policy recommendation and conclusion; finally section 5 about scope of future research and limitations of the study.

DATA SOURCES, METHOD AND MODEL.

According to Tribal Census of India (2011), India has 10.45 million Schedule Tribe (ST) populations which include more than 700 tribal communities. The rate of poverty among the STs in India is 45.3 % in rural areas and 24.1 % in urban areas. The literacy rate among the STs is 59 % which is lower than the national level (India) i.e. 73 %. Regarding basic amenities owned by tribes of India is 51 % of households have electricity facilities, 40.6 % of households have good living house, 22.6 % of households have latrine facilities, and 20 % of households have clean drinking water facilities. Regarding health status of STs in India, they have infant mortality rate is 44.4 % which is again more than national level, suffering percentage of women of age group 15-49 from an anemia is 59.8 which is again more than national level. Considering these facts Schedule Tribe of India was taken for the study because they are deprived from multiple factors as such low literacy rate, high infant mortality rate, low immunization, problem of anemia among female, problem of institutional deliveries, child

undernourished, poor access to electricity, clean drinking facility and gender gap in the literacy rate (Sarkar et.al., 2006). Their main source of income and occupation is agriculture, cattle grazing, etc. and their productivity is low. Their children still fellows their traditional occupation pattern which was started by their forefather and actively contributed to the family income by participating in it (Sujatha, 1987: NSSO, 1990).

Considering these facts, Tribal Communities of Jammu and Kashmir UT of India was considered to measure the Income Poverty and Multidimensional Poverty among them. Tribes of Jammu and Kashmir namely: Bakarwal, Balti, Beda, Bot, Boto, Brokpa, Drokpa, Dard, Shin, Changpa, Gaddi, Garra, Gujjar, Mon, Purigpa and Sippi out of these Gujjar and Bakarwal tribe was taken as a sample for the study. According to Census 2011, total population of tribes in J&K UT is 980654. Out of this 400 households were selected for the study. To arrive at this sample, a formula derived by Yamane (1973) was used as follows:

$$n = \frac{N}{1 + N(e)^2}$$

Where n= Sample Size

N= Total Population

e= Tolerable error (0.05 or 95 %)

So that,

$$n = \frac{980654}{(1 + 980654(.05)^2)}$$
$$n = 399.83 \approx 400$$

Multistage Mixed sampling was used to collect the primary data. The sampling technique as fellows, in the first stage, Jammu division of Jammu and Kashmir UT of India was selected purposively. In the next stage, Jammu division was sub-divided into hilly districts and non hilly districts. Hilly districts were identified as Poonch, Rajouri, Reasi, Udhampur, Doda, Kishtwar and Ramban and non-hilly districts are Jammu, Samba and Kathua and out of these districts one hilly district and one non hilly district were selected i.e. Jammu and Reasi by using simple random sampling (lottery method). In the next stage, these two districts were further sub-divided into tehsils and four tehsils were selected by using simple random sampling (lottery method) two from each district (except Reasi district because it have only two tehsils). In the last stage, purposive sampling technique was used to select the sample (see table 1). The main reason for purposive sampling technique was unstructured and scattered living style of tribes in the region because mostly they prefer to change their location (multiple of time in a year) in the search of goods pastures for their livestock's and laborer work.

The primary data were collected with the help of Interview schedule and direct personal investigation method. For the seconding data, official website of Ministry of Tribal Affair (Government of India) was used to extract the data. The period of collection of data was January 2019 to May 2019. The data was analyzed with the help of Excel and SPSS software. The data was analyzed with the help of statistical tools like percentage, average, scattered diagram, chi-square test and Logistic regression model.

Table 1 Multistage Sampling and Sampling Compositions

Stage I Division	Stage II Name of Districts		Stage III Name of tehsils		Stage IV Sample
Jammu Division	Hilly districts	Poonch	Reasi	Gool-Gulabgarh	116
		Rajouri			
		Reasi			
		Kishtwar		Reasi	77
		Udhampur			
		Doda			
		Ramban			
	Non Hilly districts	Jammu	Jammu	Bishnah	68
				Ranbir Singh Pora	---
		Kathua		Jammu	---
		Samba		Akhnoor	139
Total					400

Methods

In this study two measures were used i.e. monetary measure and non-monetary measure. In monetary measure single variable included i.e. per month income and in non-monetary measure, it included three dimensions i.e. education, health and living condition. These three dimensions further classified into ten indicators (see table 2). To construct the Multidimensional Poverty, Alkire and Foster, 2007 and 2011 methodology was used and to check income poverty, Indian-national poverty line i.e. monthly consumption expenditure of 4860 INR (INR-Indian Rupee) per family (Planning Commission) in rural areas was used.

Concept and measurement of Multidimensional Poverty

Poverty is a multidimensional concept and it cannot be measured with only one-dimensional measure. This one-dimensional measure fails to capture the real picture of poverty which has multiple aspects that leads to deprivations. Multidimensional Poverty Index has developed by the Oxford Poverty and Human Development Initiative which used multiple dimensions to capture the composite nature of poverty. Recent studies on multidimensional assessment of poverty (Alkire and Seth 2013; Alkire and Roche 2013; Alkire et al 2013; Alkire and Santos 2010; UNDP 2010, 2013) considered three dimensions i.e. health, education, and living standard as shown below (or see table 2):

Brief about dimensions of MPI:

1. Education:

    a. Year of schooling: Deprived if no household member has completed at least one year of schooling else not deprived.

    b. School attendance: Deprived if no children are attending school up to the age at which they should finish class 6 else not deprived.

2. Health:

a. Nutrition level measured through body mass index (BMI=kg/m², Weight/height): Deprived if undernourishment of any adult under 70 years of age else not deprived.

b. Child mortality: Deprived if two or more children have died in the household else not deprived.

3. Standard of living:

a. Cooking fuel: Deprived if the household cooks with dung or wood else not deprived.

b. Improved Sanitation: Deprived if no sanitation/toilet facility else not deprived.

c. Improved drinking water: Deprived if the household does not have access to safe drinking water or safe water is more than a 45-minute walk (round trip) else not deprived.

d. Electricity: Deprived if the household has no electricity else not deprived.

e. Floor: Deprived if the household has a dirt, sand, or dung floor else not deprived.

f. Assets: Deprived if the household has no assets (radio, mobile phone, refrigerator, etc.) and no car else not deprived.

Table 2 Indicators of Multidimensional Poverty Index

Dimensions	Indicators	Weights assigned to indicators
Education (Dimension weights=1/3)	Years of Schooling	1/6
	Child School Attendance	
Health (Dimension weights=1/3)	Child Mortality	1/6
	Nutrition	
Living Standard (Dimension weights=1/3)	Electricity	1/18
	Improved Sanitation	
	Improved Drinking Water	
	Flooring	
	Cooking Fuel	
	Assets Ownership	

In the present study, the investigator followed the same dimensions and indicators as shown above. Alkire and Foster, 2007 and 2011 methodology for multidimensional poverty was adapted to assign the weights (see table 2) to the variables and cutoff point to estimate the deprivation level. The following steps have been taken to estimate or check the Multidimensional Poverty:

In the first step, the investigator applies deprivation cut off to identify the deprivation level for each indicator. Indicators deprivation cut off denoted as $z_{i,} = x_{i,}$ *where i = person.* If indicator x_i is less than z_i then the person considered to be deprived else not deprived. All the indicators are coded with binary numbers as "1 = deprived or poor" and "0 = not deprived".

After the selection of deprivation cut off, weights are assigned to each indicator. There are ten indicators in the present study, indicators under education and health have assigned 1/6 weight each and indicators under living standard have assigned 1/18 weight.

After the deprivation cut off and weight, the deprivation score assigned to each person according to their indicators.

$$c_i = w_1 I_1 + w_2 I_2 + \ldots\ldots + w_d I_d$$

Where, $c_i=$ deprivation score, $I_i=1$ if the deprived in indicator i else $I_i= 0$ for not deprived and $w_i =$ attached to indicator i with $\sum_{I=i}^{d} w_i = 1$

After getting deprivation score, those individual or household score is equal or greater than the poverty cut-off i.e. $c_i \geq k$ ($k=1/3$) consider to be poor else consider non poor.

In the last, computing Multidimensional Poverty Index which is a combination of two key sources of information i.e. Multidimensional Headcount Ratio (H) and Incidence of Poverty (A).

Multidimensional Headcount Ratio is represents the proportion of people living in poverty and it is denoted by H.

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

Where q is number of poor and n is total number of population

Incidence of Poverty (A): It is the average deprivation score of the poor people and expressed as:

$$A = \frac{\sum_{i=1}^{n} c_i \ (k)}{q}$$

Where $c_i (k)$ is the censored deprivation score of individual i and q is the number of people who are multidimensional poor.

Multidimensional Poverty Index (MPI) is the product of H and A:

$$MPI = H * A$$

Where, H= Multidimensional headcount ratio and A= Incidence of poverty.

Model

To examine the relationship between income and multidimensional poverty variables, we first computed a dichotomous variable indicating whether the household is non poor "0" (y>=4860) or "1" poor (y<4860).

After that Pearson's Chi-square statistic, we determine whether the independent variables were associated with the income or not. After that, logistic regression model was applied to predict the probability of reduction of multidimensional poverty and their variables.

$$\text{In(Odds)} = \log\left(\frac{p}{p-1}\right) = \beta_1 + \beta_2\, E + \beta_3\, H + \ \beta_4\, W + \beta_5 S +$$

$$\beta_6 HOS + \beta_7\, EG + \ \beta_8\, A + \ \beta_9\, MP + Ut$$

Where, p: Predicted probability to being non poor, p-1: predicted probability to being poor, E: Education, H: Health, W: Water, S: Sanitation, HOS: Housing, EG: Energy A: Asset, MP: Multidimensional poverty, Ut: error term

FINDINGS AND DISCUSSIONS

Figure 1 revealed the relationship between the deprivation score which is deducted from the non monetary information of the households and the income of the households. It shows a little relation between the deprivation score and income as deprivation score decline with the increase in income. It reflects that income have some influence socio-economic variables like education, health and living condition. If income increases it improve the education level, health condition and living condition. Further, onward certain level of income there is no correlation between the income and multidimensional poverty. For better understanding the scattered diagram is illustrated and divided into four quarters Q1, Q2, Q3 and Q4 which is made by drawing horizontal line shows multidimensional poor (MP) ratio and vertical line shows income poverty line (IP). People fall under Q2 are not poor monetary as well as non monetary basis but those people fall under Q4 they all are poor in both the cases. The remaining two cases (Q1 & Q3) are the concerning fact of the study because there is no correlation between both the measures. The fact shown in these two quarters or cases as fellows: case one Q1 shows people are multidimensionally poor but not income wise and case two Q3 shows people are poor income wise but not multidimensionally. Difference in result shown by both the measures in Q1 and Q3 reflects *to implement both approaches as a complimentary measure in the analysis of poverty to capture the clear picture of poverty*. For more in-depth analysis of this, the matrix between Multidimensional poverty and Income poverty is also formed shown in table 3.

Figure 1 Relationship between Net Income and Deprivation Score
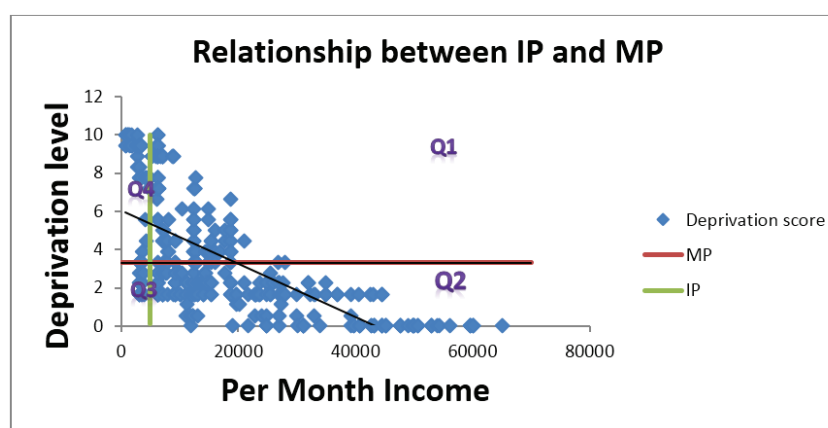
Source: Primary data

Table 3 Matrix between Multidimensional Poverty * Income Poverty

In Percentage

Poor (X<4860)		Income Poverty		Total
		Non-Poor (X≥4860)		
Multidimensional Poverty	Poor ($c_i \geq 1/3$)	11.7	33.2	45
	Non-Poor($c_i < 1/3$)	3	52	55
Total		14.7	85.2	100

Source: Primary data
Note: Indian national poverty line is Rs. 4860 monthly family income (Source: Planning Commission)

The matrix result in table 3 revealed that 11.7 % households are poor on the basis of income and multidimensional poverty. 52 % households are non-poor found in the surveyed area in context of income poverty and multidimensional poverty. Only 3 % of households are considered as poor on the basis of income but not poor multidimensionally and 33.2 % of households are multidimensionally poor but not in context of income. The study reported that there is a conflict of 36.2

% (33.2 % + 3 %) in the measurement of poverty by using monetary approach and non monetary approach. Further this discrepancy more in income poverty which is 33.2 % while in multidimensional poverty is 3 %. The accuracy of monetary measure is 63.7 % (52 % +11.7 %) found in the study and the remaining poor identified by the multidimensional poverty measure. *So, it is suggested that poverty reduction policies meant not only to cover income based poverty but also to cover the multidimensional aspects as well.*

Further, this study also looks the relationship between the two by increasing per month family income from 4860 INR to 6600 INR (see table 3). After this variation, the accuracy of monetary measure is improved from 63.7 % to 70 % (47.5 % +22.5 %) and remaining 30 % again untraced by this measure but identified by MP. The ratio of conflict table in table 4 as compare to table 3 is decline from 36.2 % to 30 % (22.5 %+7.5 %)(see table 4). Again the discrepancy is more in income poverty i.e. 22.5 % while in multidimensional poverty is 7.5 %. The study reported that both the measures have shown different result and it is suggested that both the measure are important and non replace to each other in the process of finding poverty. Hence, *it is again suggested that there is need to implement both the measures as a complimentary measure to identify a true picture of poverty because of conflict remain exist in it.*

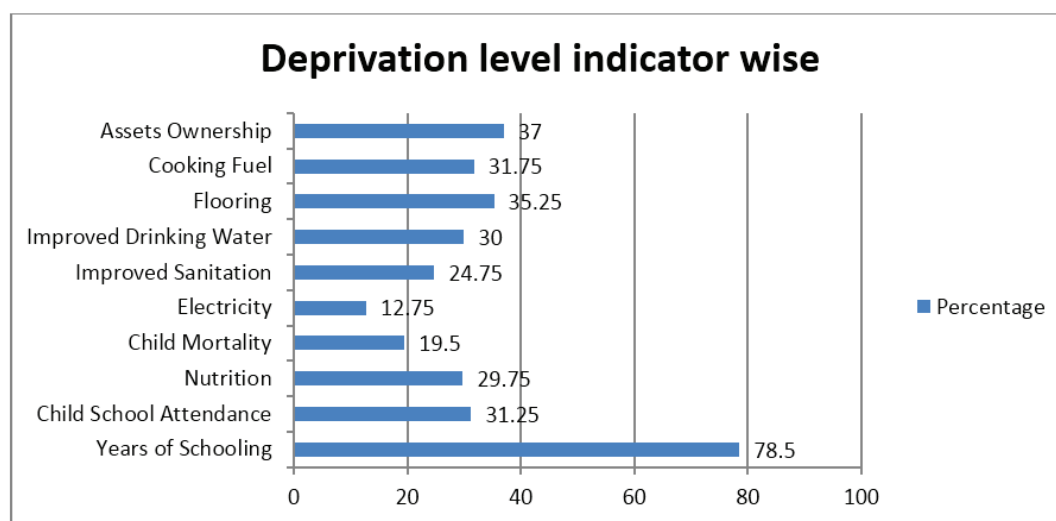**Table 4 Matrix between Income Poverty and Multidimensional Poverty.**

Poor (X<6600)		Income Poverty (In percentage)		Total
		Non-Poor (X≥6600)		
Multidimensional Poverty	Poor ($ci≥1/3$)	22.5	22.5	45
	Non-Poor($ci<1/3$)	7.5	47.5	55
Total		30	70	100

Source: Primary data
Note: In Table 4 the author has taken Income poverty line as a 6600 INR.

Further, how much they are deprived in each indicator wise shown in Fig. 2. They are deprived more in education, standard of living than the health. Deprivation level among Tribal communities is 24.7 % in sanitation, 35.2 % in dirty house floor, 37 % in assets/ housing infrastructure, 78.5 % in year of schooling, 31.7% in cooking fuel, 31.2 % % in children enrollment, 30 % in clean water, and 12.7 % in electricity.

Figure 2 Deprivation Level Indicator Wise

Source: Primary data

To examine the relationship between Income poverty and multidimensional poverty Binary Logistic Regression was applied. The result of Omnibus tests of model is 86.315 which is significant at p<0.5. As per the result of Cox and Snell R Square and Nagelkerke R square revealed that the explained variation in the income based on our model is ranges from 19.4% to 34.2%. P-value of Hosmer and Leemeshow test is .165 which greater than the level of significance α=0.05, hence data fits for the model well. Therefore, our fitted logistic regression model is good fit. Overall our predictions success rate is 86.8%.

Table 5 Result of Logistic Regression

Variables in the Equation						
Variables	B	S.E.	Wald	Df	Sig.	Exp(B)
Constant	4.149	.505	67.489	1	.000	63.401
Education	-1.135	.399	8.084	1	.004	.321
Health	-.791	.279	8.043	1	.005	.453
Water	-.944	.379	6.206	1	.013	.389
Sanitation	-.538	.355	2.295	1	.130	.584
Housing	-1.492	.372	16.112	1	.000	.225
Energy	-.694	.337	4.232	1	.040	.500
Asset	-.983	.343	8.202	1	.004	.374
Overall Deprivation	-.395	.052	58.063	1	.000	.674

Source: Authors own calculation by using primary data

The table 5 shows result of logistic regression between income and multidimensional variables. It shows that with the increase of one unit of income per household their overall deprivation decline by .674. This analysis also extended to all variables of multidimensional poverty to look the impact of income on it and found that there is significant impact of income on the multidimensional variables. With the increase of one unit of income the incidence of educational poverty decline by .321. In health poverty, by the increase of one unit income the incidence of health poverty decline by .453. It also shows that with the increase of income there is an improvement in the living standard as study reported that energy poverty declined by .500, housing poverty declined by .225 and asset poverty declined by .374 (except sanitation). Hence, in the end the study reported that with the increase in income the incidence of multidimensional poverty reduce significantly.

POLICY RECOMMENDATIONS AND CONCLUSION

Monetary aspect of every individual is very important because it is directly or indirectly linked with their standard of living or other aspects of life. But sometimes it doesn't reveal the clear outlook of society or individual like what is the health condition?, what is the education attainment or level?, what is housing condition?, etc. So in this regards, this study applies monetary measure along with non-monetary measure to measures the magnitude of poverty among the Tribal Communities to see the relationship and deference between them. Monetary measure considered only single variable i.e. income whereas non monetary measure considered three dimensions i.e. education, health and living standard and these three dimensions further divided into ten indicators as per table 2.

The present study revealed that there is a little relation between income and deprivation scores (MP). It reflects that deprivation score which is made up of ten indicators goes decline as the level of income increase. But onward certain level of income there is no relationship between both the approaches. The matrix between monetary and non monetary measures revealed that there is a conflict of 36.7 % in the measurement of poverty by applying both the measures. This discrepancy is more in monetary measure (33.2 %) then the non monetary measure (3 %). The accuracy of monetary measure is 63.7 % (52% +11.7%) found in the study. On the basis of result founded by the study, *it is recommended to implement monetary measure along with multidimensional poverty is the need of the hour to capture the clear picture of poverty. It is also suggested that poverty reduction policies should be meant not only to cover the income based poverty*

but also to cover the multidimensional aspects as well. Because, the present study found that tribes of Jammu and Kashmir are deprived in education, living standard and health condition. The deprivation level are 24.7 % in sanitation, 35.2 % in dirty house floor, 37 % in assets/ housing infrastructure, 78.5 % in year of schooling, 31.7% in cooking fuel, 31.2 % % in children enrollment, 30 % in clean water, and 12.7 % in electricity.

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