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ROLE OF EDUCATION AND TRAINING IN REDUCING MALNUTRITION AMONG ADULTS OF SLUMS IN MUMBAI METROPOLITAN REGION

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Abstract
Incidence of adult malnutrition is widely viewed in Mumbai Metropolitan Region. Women are more malnourished as compare to the male. The lower literacy rate among adults is the main problem of higher incidence of malnutrition. As the educational attainment of women increases in years, the incidence of malnutrition declines in suburb. The physical household asset holding among malnourished adults is low. The modern contraceptive use is low among malnourished adults due to lack of knowledge and availability of contraceptive method. Health care access for pre and post natal care among malnourished female is very low. The logistic regression results for female shows that the malnourishment is positively correlated to sex, drinking water trips by women and children, purify water, female sterilization and immediate breastfeeding. It is negatively co-related to age, education, per capita income, source of water, number of trips, pills and IUD. The logistic regression for men shows negative correlation with sex, age, education, television, and withdrawal method of contraceptive. It is positively correlated to knowledge of nutrition. Therefore state government must frame policies to improve health of people in slums of metropolitan region. There is need to provide infrastructural facilities such as water supply, sanitation, sewage, electricity and roads in slums. Health care staff must provide pre and post natal care and modern contraceptive methods in slums. The government must provide income generating activities in slums. It will help to improve income and asset holding among poor people. Government must invest more in skill up gradation programs to improve the quality of human resource in region. Such policies will certainly help to reduce to incidence of adult malnutrition in Mumbai Metropolitan Region.
Keywords: Health care, Mass media, Assets.

1. INTRODUCTION

Economic growth in any country must reduce the incidence of malnutrition among people. India has relatively high economic growth rates in the past few years. But with lower progress in areas of life expectancy, education and standard of living is observed (Varadharaja K. et.al 2013). The important concern is that anthropometric indicators of nutrition for both adults and children are among the worst in the world. The improvement of these measures of nutrition appears to be slow relative to what might be expected in the light of international experience (Deaton A. and Jean D.2009). High malnutrition among adults has immediate health and economics effects. It also affects on development of future

generations. Malnutrition in women and men can result in reduced productivity, slow recovery from illnesses, increased susceptibility to infections, and a heightened risk of adverse pregnancy outcomes. A woman's nutritional status has important implications for her health as well as the health of her children. A woman with poor nutritional status has a greater risk of obstructed labor, having a baby with a low birth weight, having adverse pregnancy outcomes, producing lower quality breast milk, death due to postpartum hemorrhage and illness for her and her baby. Women's height can be used to identify women at risk of having a difficult delivery, since small stature is often related to small pelvic size. The risk of having a baby with a low birth weight is also higher for mothers who are short (Mandali S. et.al. 2011).

Mumbai city is financial capital of country. Many financial institutions and headquarters of companies are located in city. City provides employment opportunities to skilled and unskilled population. Migration is responsible for high growth of population in region. The increase in population has affected on infrastructural facilities. The slums in region are ignored the basic urban infrastructural facilities. Therefore the incidence of adult malnutrition is widely viewed in slums of Mumbai Metropolitan Region (MMR). Women are more malnourished as compare to the male. The women are always denied the good quality of food, medical care in the families. The low level educational attainment among male and female is the main problem of higher incidence of malnutrition. Due to low education and poverty, most of the underweight male and female get marry before the legal age of marriage. It is not only affects their own health but the physical growth and development of future generations. The vicious cycle of malnutrition cannot be solved due to such phenomena exists in slums of metropolitan region. Household asset holding is important determinant of adult malnutrition. Asset holding such as bicycle, bike and car is useful for mobility of household members. They can be used for access of various community resources. The health care to any member can be possible on urgent basis with the help of vehicles. The access to radio and telephone is useful for knowledge of nutrition, family planning and current affairs. But poor slum households do not have access to radio and television. The women and men do not have access to medical care and contraceptive use. The use of modern contraceptives required knowledge and access to method. The health workers are expected to provide knowledge of modern contraceptive methods through home visits and in health care facility. But due to overcrowded health care facilities and lack of time with health workers and adults, it is not possible to get more knowledge of contraceptives. Therefore the knowledge and actual use of modern contraceptives such as pills, condom, IUD is very low in slums. Therefore more children are observed in a family without proper planning of births. The female sterilization is higher among older female but male vasectomy rate is low. In order to overcome with the knowledge and availability of modern method, the adults are using

the traditional method of contraceptives. The periodic absentee and withdrawal method is popular among poor people of slums. The access to newspapers is very low in poor households. The adults do not read daily newspapers and they have less knowledge of nutrition. They do not watch television and cinema regularly. They are busy with their daily wage earning activities. The women workers are involved in household chores, child care, wage earning etc. Therefore the access to antenatal care is very low in slums. Women do not get at least three essential antenatal care. The health care facilities are overcrowded in region. In order to have ante natal care, the women are required to accompany husband and other in laws member. The opportunity cost of receiving health care is high at health care facility. In government hospitals, the delivery assistance to poor women by medical staff is not fully covered. The new mothers do not know much about exclusive breastfeeding to child. An exclusive breastfeeding is the best solution to reduce malnutrition among children. The immediate breastfeeding after delivery is low. It is because of illiteracy, superstitions and wrong beliefs. The malnourished mothers provide outside food to much early to their children. Unhygienic food and water easily make children worse off than what they are at birth time. Poverty among households is the main cause of malnourishment among female. There is no clean, safe and reliable access to drinking water. Women daily carry drinking water in slums. But due to poor health, most of the mothers transfer responsibility of carrying water to children. Such vicious cycle of poverty and malnutrition among adults in slums cannot be broken without support of government initiatives in region. First part of paper explains about incidence of malnutrition in region. Second part of paper explains about the logistic regression results for male and female and last part of paper gives details of policy implication and conclusion.

2. MEANING AND DEFINITION OF MALNUTRITION

We need to understand the meaning and definition of adult malnutrition. This is because nutrition is the most important factor that regulates the health and well being of an individual. There are different definitions given by researchers of malnutrition among adults. Few researchers have emphasized on intake approach whereas some researchers have focused on output approach. The intake approach explains the micro-nutrition requirement. The requirement of different food stuff e.g. protein, fat, carbohydrate, minerals and vitamins are essential in proper ratio for adequate growth and nutrition (Banerjee B. and Mandal. 2005). Such micronutrients are meeting the need of physical growth process of adults. The nutrient intake is an important determinant of body composition and physiologic function. The ultimate goal of the nutrition assessment is to determine whether nutrient intake has been and continues to be adequate to maintain or attain body composition and physiologic function that is optimal for the health and long-term survival of the individual (Gordon L.et.al.2013). But nutrient intakes are

difficult to measure due to sex, age and work of adults. In output approach, the intake of different nutrients is not taken into consideration. For nutritional assessment of adults, anthropometric measures are used. Therefore nutritional status of an individual is classified as normal or malnourished.

Malnutrition refers to all deviations from adequate and optimal nutritional status. It refers not only to inadequate dietary intake or under nutrition but also to over nutrition characterized by obesity and its associated co-morbidities such as diabetes mellitus, cardiovascular disease, hypertension and stroke, osteoporosis and some forms of cancer. The term 'malnutrition' refers to under nutrition, over nutrition and specific nutrient deficiencies or imbalance (Chakraborty R. and Kaushik Bose 2014**).** If we **c**ompare well-nourished and malnourished persons then the mortality rates are higher in malnourished persons (Turedi A. 2010). Malnutrition has different effects on rich and poor adults. The symmetric growth retardation is commonly seen in low-income groups, while asymmetric growth retardation prevails in high income groups (Krishnaswamy K. et.al 2002). In recent years, nutrition is focused as a public policy issue and government is seriously thinking about it. In India, it has become a major topic of discussion and planning bodies. They concerned social, political, and economic development on the basis of nutrition. In general, nobody denies that nutrition is an important factor in the life of the individual from the time of conception to the time of death. Therefore nutrition is important part in public policy in India.

3. MEASUREMENT OF ADULT MALNUTRITION

Among adults, the malnutrition is measured with the help of anthropometric measures. The body mass index is the best measure of adult malnutrition. It is defined as follows.

$$BMI = \frac{W}{H^2_{(m)}} \qquad (1)$$

Among adults, Body Mass Index (BMI) is calculated by dividing weight in kilograms by the square of height in meters. BMI is used to define underweight or overweight. The WHO expert committee has suggested the classifications: mild underweight (BMI 17-18.49 kg/m^2), moderate underweight (BMI 16-16.99) and severe underweight (BMI <16). These three groups are considered as chronic energy deficient (CED). For overweight, the categories are as follows: Grade 1 (BMI 25-29.99), Grade 2 (BMI 30-00-39.99) and Grade 3 (BMI>40.00). Each of these adult measures has been related to morbidity and mortality (Gillespie S. and Lawrence H. 2003). We have used all the above categories to classify adults as malnourished and normal.

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3.1 Data and methodology

For this study, we have collected primary data of slum households in Mumbai Metropolitan Region. We have collected 767 households' data from eight slums such as Mankhurd East and West, Govandi East and West, Kalwa, Koparkhairne, Rabale, Turbhe, Vashi and Ghatkopar. The household heads and women are interviewed separately during this survey. The questionnaire comprises as different questions related to household members, income and expenditure, fertility behavior, household assets, media exposure and illness. The primary data is collected during May-June 2014. We have analyzed data in SPSS@20 and STATA@12 software.

3.2 Economic model:

We have developed economic model for malnutrition among adults in Mumbai Metropolitan Region. It is explained as follows.

M= (E, Ma, Ha,Cu, Mk, Hc) (2)

Where

M=Malnutrition among adults

E=Educational attainment

Ma=Age at marriage

Ha=Household assets

Cu=Contraceptive used

Mk=Mass media access and knowledge

Hc=Health care access

Each of the above variables is depending upon other variables. They are explained as follows.

E= (P, S, C) (3)

Education of adults is classified as primary, secondary school and college studied.

Ma= (La-Aa) (4)

Age at marriage is defined as legal age minus actual age. The La>Ma means legal age is more than actual age at marriage of adults. Similarly legal age is equal to marriage i.e. La=Ma. Lastly, actual marriage age is more than legal age. It is defined as La<Ma. Such cases are few in this survey. At the

same time, the marriage certificate is difficult to observe in slums due to low educational status of adults.

Ha= (He, Eg, V) (5)

Household assets are classified as household equipments (He), electronic goods (Eg) and vehicles (V). Household equipments are kitchenware and used for cooking purposes. Electronic goods comprise as television, Radio, telephone, refrigerator, fan etc. Vehicles comprises as the bicycle, car, scooter.

Cu= (M, T) (6)

Contraceptive use consists of modern and traditional contraceptives. Modern contraceptives comprises as the pills, condoms, IUD, female sterilization and vasectomy. The traditional methods of contraceptives comprises as periodic absentee, withdrawal method etc.

Mk= (N, T, Kn) (7)

Mass media access and knowledge consists of access to newspapers (N), television (T) and knowledge of nutrition (Kn).

Hc = (A, D, Da,) ` (8)

Health care consists of the antenatal care (A), delivery in health facility (D) and delivery assisted by health professionals (Da).

3.3 Adult malnutrition in MMR:

Adult malnutrition is mainly measured as the weight upon height square. Height is measured in meters. The incidence of malnutrition among adults in region is reported in the following table.

TABLE 1 INCIDENCE OF MALNUTRITION AMONG ADULTS

Suburb	Sever		Moderate		Mild		Normal		obese1		obese2		obese3	
Sex	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Mankhurd (E)	19.57	9.09	2.17	2.73	14.13	10.91	50.00	36.36	9.78	25.45	3.26	14.55	1.09	0.91
Mankhurd(W)	3.70	0.00	5.56	3.23	18.52	9.68	57.41	46.77	7.41	17.74	7.41	17.74	0.00	4.84
Govandi (E)	0.00	0.00	10.00	0.00	10.00	18.92	65	48.65	10.00	16.22	5.00	16.22	0.00	0.00
Govandi (W)	19.18	10.53	4.11	3.16	12.33	4.21	49.32	44.21	12.33	28.42	2.74	8.42	0.00	1.05
Kalwa	9.38	8.71	3.13	4.92	17.71	10.23	50.00	40.91	14.58	20.08	5.21	11.36	0.00	3.79
Koparkhairne	18.18	11.49	4.55	5.75	15.91	6.9	43.18	47.13	11.36	16.09	4.55	5.75	2.27	6.90
Rabale	7.69	6.98	0.00	2.33	11.54	11.63	61.54	48.84	15.38	27.91	3.85	2.33	0.00	0.00
Turbe	13.46	0.00	5.77	6.41	7.69	10.26	38.46	51.28	19.23	23.08	13.46	8.97	1.92	0.00
Vashi	0.00	8.33	10.53	5.56	10.53	5.56	71.05	66.67	5.26	8.33	2.63	5.56	0.00	0.00
Ghatkopar	0.00	11.11	9.09	0.00	18.18	16.67	59.09	55.56	13.64	11.11	0.00	5.56	0.00	0.00

Source: Computed from primary data

In Mankhurd (E), 19.57 percent male are severely malnourished. The Mankhurd slum is famous for malnutrition in region. But in Govandi, Vashi and Ghatkopar , the incidence of severe malnourishment

among male is not found. Incidence of severe malnourishment is 11.49 percent in Koparkhairne. In Mankhurd (W), Govandi (E) and Turbhe, we have not found any incidence of severe malnourishment among women. This is because of less number of women from such slums. The incidence of moderate malnourishment is 10.53 percent among male in Vashi. Such incidence is not found in Rabale. Incidence of moderate malnourishment among female is 6.41 percent in Turbhe. The incidence of mild malnourishment among male is 18.52 percent in Mankhurd (W). Among female, it is 18.92 percent in Govandi (E). Most of the time mild malnutrition among adults is ignored. After some time, such adults may fall under moderate malnutrition category. Therefore due attention should be given to the mildly malnourished cases because anyone think they are healthy (Molla Daniel e.al.2013).

In Koparkhairne, only 43.18 percent male have normal BMI. For female, it is 40.91 percent in Kalwa. The obese 1 among male is 19.23 percent in Turbhe. Among female, it is 28.42 percent in Govandi (W). The obese 2 male are 13.46 percent in Turbe. For female, it is 17.74 percent in Mankhurd (W). In Koparkhairne, 2.27 percent male and 6.90 percent female are obese 3. Malnutrition among adults results from imbalance between the needs of the body's and the intake of nutrients. In India, gender inequality in nutrition is present from infancy to adulthood. Women never reach their full growth potential due to nutritional deprivation. Malnutrition in women is related to poverty, lack of development, lack of awareness and illiteracy (Dewan Manju 2008). Education certainly helps adults to understand the nutritional contents of food. It helps to achieve skills and increase income. Educated adults are always efficient to process information and use community services. It is evident that higher level of education easily eliminates the incidence of malnutrition. Therefore higher educational achievement among adults means no malnutrition incidence.

TABLE 2 INCIDENCE OF MALNUTRITION AND EDUCATION OF ADULTS

	Female			Male		
Education	**Severe**	**Moderate**	**Mild**	**Severe**	**Moderate**	**Mild**
Illiterate	41.94	58.82	51.90	37.10	31.82	41.10
Primary	6.45	1.61	50.00	1.61	0.00	12.90
Secondary	45.16	19.35	38.71	50.00	20.97	51.61
College	4.84	1.61	0.00	9.68	3.23	3.23

Source: As per table 1

Nearly 45.16 percent secondary studied women are severely malnourished. Total 58.82 percent illiterate females are moderately malnourished. Total 51.90 percent illiterate women are mild malnourished. It is confirm that the higher malnutrition is related to lower educational status of adults. Half of secondary studied male are severely malnourished. Moderate malnutrition among illiterate male are 31.82 percent. Mild malnourished 51.61 percent male are secondary school studied. Age of

marriage is sole determinants of malnutrition among adults. At lower age, female abdominal development is not taking place. If the female get married early then self and child development gets affect due to lower economic resources. Male members do not earn sufficient income which is required for woman and children. At lower age, there is competition for economic resources for parents and children. It is always affecting adversely on adults health and well being.

TABLE 3 MALNUTRITION AND AGE AT MARRIAGE

	Female			Male		
Age at marriage	Severe	Moderate	Mild	Severe	Moderate	Mild
below 18	27.42	29.03	53.23	37.10	8.06	43.55
At 18	33.87	9.68	32.26	25.81	12.90	35.48
above 18	38.71	16.13	40.32	35.48	14.52	37.10

Source: As per table 1

Total 27.42 percent severely malnourished female got married before 18 years. Around 29.03 percent moderate malnourished female got married below 18 years. Nearly 53.23 percent mild malnourished females got married below 18 years. Lower age at marriage and malnutrition affects adversely on future generation. The low birth weight babies and low breastfeeding can be possible in such situation. Total 37.10 percent severely malnourished male got married below 18 years. Total 43.55 percent mild malnourished male got married before 18 years of age. It means both malnourished male and female got married much earlier in slums. Household assets are important to determine the well being of the adults. Television and radio in house certainly helps to achieve nutritional knowledge and current affairs. Ownership of bicycle, car, bike helps adults to improve mobility. They can use community resources with the help of vehicles. Access to refrigerator helps for nutritional security and improve intake of nutrition.

TABLE 4 HOUSEHOLD ASSETS AND MALNUTRITION

	Female			Male		
Household assets	Severe	Moderate	Mild	Severe	Moderate	Mild
Cooker	74.19	33.87	90.32	72.58	20.97	74.19
Chair table	17.74	9.68	22.58	17.74	6.45	24.19
Watch	12.90	9.68	19.35	19.35	3.23	29.03
Electricity	87.10	40.32	96.77	83.87	22.58	95.16
Fan	87.10	40.32	91.61	16.13	22.58	91.94
Bicycle	8.06	4.84	14.52	0.00	1.61	9.68
Swing machine	0.00	4.84	0.00	0.00	0.00	4.84
Radio	0.00	1.61	0.00	0.00	0.00	1.61
Telephone	35.48	17.74	40.32	6.45	8.06	30.65
Refrigerator	1.61	0.00	0.00	0.00	0.00	0.00

Television	62.90	24.19	67.74	53.23	16.13	61.29
Bike	6.45	0.00	4.84	12.90	1.61	8.06
Car	0.00	0.00	1.61	0.00	0.00	0.00

Source: As per table 1

Nearly 90.32 percent women are mild malnourished but they have cooker in house. Only 24.19 percent male are mild malnourished but they have chair and table in house. The 29 percent male are mild malnourished but they have watch in house. Total 96.77 percent houses have electricity but female are mild malnourished. Nearly 91.94 percent houses have fan but men are mild malnourished. Nearly 14.52 percent mild malnourished female have bicycle in the house. Total 4.84 percent mild malnourished male have swing machine in house. Only 1.61 percent mild malnourished male and moderate malnourished female have radio in house. Nearly 40.32 percent mild malnourished female have telephone at home. Only 1.62 percent mild malnourished women have refrigerator at home. Total 67.74 percent women are mild malnourished but the households have television. Only 12.90 percent households have bike but men are severely malnourished. Nearly 1.61 percent women are mild malnourished but households have car. Contraceptive access and use helps women and men to plan future pregnancies. It helps well being of self as well as children. Women with access to contraceptives will always promote well being of children and self. But use of contraceptives is lower among malnourished adults.

TABLE 5 CONTRACEPTIVE USED AND MALNUTRITION

	Female			Male		
Contraceptive used	Severe	Moderate	Mild	Severe	Moderate	Mild
Pill	6.45	11.29	11.29	6.45	1.61	9.68
Condom	4.84	6.45	11.29	4.84	4.84	11.29
IUD	0.00	1.61	1.61	0.00	0.00	0.00
Female Sterilization	45.16	25.81	37.10	0.00	0.00	0.00
Vasectomy	0.00	0.00	0.00	0.00	0.00	3.23
Periodic absentee	12.90	6.45	22.58	8.06	4.84	4.84
Withdrawal	19.35	3.23	19.35	9.68	3.23	12.90

Source: As per table 1

Total 11.29 percent female are mild and moderate malnourished but they are using pill. Nearly 9.68 percent mild malnourished male are using pills. Total 11.29 percent mild malnourished male and female are using condom for family planning. Only 1.61 percent mild and moderate malnourished female are using IUD. Maximum 45.16 percent severely malnourished female had sterilization. Only 3.23 percent mild malnourished male had vasectomy. The male do not perform vasectomy. It is the female who do the family planning operation. The periodic absentee method is used by the 22.58 percent female. But 12.90 percent mild malnourished male have used withdrawal method as family planning method. The

19.35 percent severe and mild malnourished female have used the withdrawal method as family planning method. Women and men do not read daily newspaper and watch television regularly. They do not have time due to daily income generating activities.

TABLE 6 MEDIA ACCESS AND KNOWLEDGE AND MALNUTRITION AMONG ADULTS

Media access and knowledge	Female			Male		
	Severe	Moderate	Mild	Severe	Moderate	Mild
Read newspaper	12.90	9.68	19.35	16.13	6.45	11.29
Watch television	58.06	24.19	67.74	62.90	17.74	69.35
Watch cinema	30.65	12.90	38.71	58.06	12.90	51.61
Knowledge of nutrition	12.90	8.06	16.13	29.03	8.06	22.58

Source: As per table 1

Only 19.35 percent mild malnourished female read newspaper regularly in slums. Total 69.35 percent mild malnourished men watch television regularly. Nearly 58.06 percent male are severely malnourished but they watch cinema regularly on television. Around 29.03 percent severe malnourished male have knowledge of nutrition. Among mild malnourished female, it is 16.13 percent. Health care to malnourished female is an important aspect. It can cure women as well as a child in her womb.

TABLE 7 MALNUTRITION AND HEALTH CARE ACCESS

Health care access	Female		
	Severe	Moderate	Mild
Antenatal care received	22.58	24.19	37.10
Three ANC received	35.48	17.74	32.26
No ANC received	33.87	12.90	43.55
Got treatment	12.90	11.29	11.29
Tablets (Iron and Folic)	30.65	29.03	48.39
Injection	48.39	37.10	61.29
Delivery in government hospital	20.97	14.52	33.87
Delivery assistance	45.16	38.71	54.84
Normal	88.71	46.77	84.84
Cesarean	1.61	1.61	11.29
Immediate breastfeeding	53.23	38.71	75.81
Still breastfeeding	24.19	12.90	37.10
Except milk outside food	19.35	9.68	27.42
Anganwadi food	8.06	11.29	8.06

Source: As per table 1

Around 37.10 percent mild malnourished females have received Ante Natal Care (ANC). But 43.55 percent mild malnourished female have not received any ANC. But 35.48 percent severe malnourished female have received all minimum three ANC. Nearly 48.39 percent female have received iron and folic

acid tablets and 48.39 percent mild malnourished females have received the injections during pregnancy. There are only 33.87 percent female in the mild malnourished category have delivered the baby in hospital. But 54.84 percent mild malnourished female have received delivery assistance by health staff. Total 84.84 percent mild malnourished female had normal delivery. The 11.29 percent mild malnourished female had caesarian. During pregnancy, babies are fed by their mothers, receiving all their nourishments through the placenta and umbilical cord. In this way the mother's body supply her baby with everything it demands and thus the mother's micronutrients level directly affects her baby's development. When it comes to eating and drinking, what is good for a mother also benefits her child. This natural fact therefore helps mothers to positively influence their baby's growth and development as well as baby's long term health and well being (Opara Jacinta 2011). Child breastfeeding is important after delivery. But due to lack of knowledge and superstitions, women do not breastfeed their children after delivery. In this survey, we found that 75.81 percent mild malnourished female have immediately breastfeed baby after delivery and total 37.10 percent are still breastfeeding small baby. Total 27.42 percent women are giving milk plus outside food to small children. But only 11.29 percent moderate malnourished female are providing anganwadi food.

4. REGRESSION RESULTS

In order to examine the socio-economic and demographic co-relation with the malnourished adults, we have used the logistic regression (Greene W. 2003). The logistic regression gives the odd ratio for malnourished adults with compare to non malnourished adults. We have used this model to male and female in Mumbai Metropolitan Region. The model is explained as follows

$f(Z) = e^z/e^{z+1}$

$=1/1+e^z$

$Z = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots\ldots + \beta_k x_k,$ (9)

Where

Z = Dependent variable

β_0= Intercept

The β_1, β_2, β_3 are "regression co-efficient" of x_1, x_2, x_3 respectively. The variables x_1, x_2, x_3 are considered as the independent variables. Such independent variables are of socio-economic and demographic category. The results are presented in following table.

TABLE 8 LOGISTIC REGRESSION FOR FEMALES

Variables	Co-efficient	Standard error	Wald test
Sex	3.08*	0.33	85.71
Age	-0.02**	0.00	4.88
Education	-0.05**	0.02	5.60
Per capita income	-0.00**	0.00	4.63
Source of water	-0.46**	0.22	5.03
No of trips	-0.09***	0.06	2.65
Trip by women	0.13***	0.08	2.88
Trips by children	0.10***	0.80	1.97
Purify water	0.65*	0.41	7.84
Female sterilization	0.58*	0.21	7.84
Pills	-0.56**	0.28	4.02
IUD	-0.65*	0.26	6.10
Immediate breastfeeding	0.04*	0.02	5.92
Constant	-4.04*	0.49	67.47
	-2 Log likelihood= 958.46	Cox & Snell R Square=0.11	Nagelkerke R Square=0.24

*** Significant at 10 percent ** significant at 5 percent * significant at 1 percent

The female are more malnourished as compare to male. They are 3 times more likely to be malnourished as compare to male. The co-relation is statistically significant and positively correlated with female. The age of the women is lower then there is 2 percent more chance that they would be malnourished. It is negatively co-related and statistically significant. Education of the women is negatively co-related with BMI. It means illiterate women have 5 percent more chance that they are malnourished. Per capita income is negatively co-related with BMI of mothers. It means women with low per capita income are more malnourished. Households do not have their private source of water. They are depending upon the public tap. The malnourished women do not have fixed and regular source of drinking water. The numbers of trips are negatively co-related with malnourished women. It means they do not carry drinking water which is required for the family. They transfer the responsibility to carry drinking water on children. Therefore the children of the malnourished mothers carry drinking water in slums. Such relationship is statistically significant and positively co-related.

The malnourished mothers purify the water with simple cloth and it is statistically significant and positively co-related. Most of the malnourished women have done the sterilization. It is 58 percent more

as compare to the other women. The malnourished women do not take pills as method of family planning. It is 56 percent less as compare to non malnourished mothers. Malnourished mothers have breastfeed their baby immediately after birth. It is positive and statistically significant. We have not measured the actual quantity of milk given to small children but they said it is breastfed immediately after birth. We have used logistic regression for men in metropolitan region.

TABLE 9 LOGISTIC REGRESSION FOR MALE

Variables	Co-efficient	Standard error	Wald test
Sex	-3.03*	0.36	68.01
Age	-0.02*	0.00	9.37
Education	-0.05*	0.02	6.95
Television	-0.63*	0.22	7.73
Know nutrition	0.39***	0.21	3.39
Withdrawal method	-0.56***	0.32	3.00
Constant	-1.20*	0.30	15.92
	-2 Log likelihood= 901.23	Cox & Snell R Square=0.09	Nagelkerke R Square=0.22

*** Significant at 10 percent ** significant at 5 percent * significant at 1 percent

The male are not malnourished as compare to female. They are 3 times less likely to be malnourished. The co-relation is statistically significant and negatively correlated. The age of the men are lower then there is 2 percent more chance that they would be malnourished. It is negatively co-related and statistically significant. Education of the men is negatively co-related with BMI. It means less educated men have 5 percent more chance that they will be malnourished. The men with malnourishment do not have television at home. It is statistically significant and negatively co-related. Men know about nutrition and it is positively co-related. Men do not use the withdrawal method as family planning method. It is negatively co-related and statistically significant. Perhaps they do not want to disclose or report this method.

5. POLICY IMPLICATION

The incidence of malnutrition is higher among adults in Mumbai Metropolitan Region (MMR). The higher incidence of adult malnutrition is not expected in MMR. The MMR provides skilled and unskilled employment opportunities to people in different sectors. In Mumbai Metropolitan Region, economic growth is higher but equal distribution of economic resources is not done properly. The poor people in region are continuously denied the access to infrastructural facilities. The higher incidence of malnutrition among adults is a major concern in this study. It is important to tackle the problem of nutrition both through direct nutrition intervention for especially vulnerable groups as well as through various development policy instruments which will create conditions for improved nutrition (Ojha 2011,

Gopalan C. 2013). We found women are more malnourished as compare to men. The maternal malnutrition has multigenerational adverse effects on human health and development. The study has found that given the gendered division of responsibilities and labor, it is likely that men's work involves more expenditure of muscular energy than do women's work. This might partly account for similar chronic energy deficiency status even with differential food intake. Hence, the absence of gender gap in chronic energy deficiency does not imply that there is no bias or discrimination against women: the absence of gap might persist despite the presence of gender gap in the intake of nutrients (Jose S. 2011). The state government must focus more on education sector. The low education is a primary cause of undernourishment among male and female in region. The state government must provide drinking water supply in all slums. The safe, clean and regular drinking water supply will reduce the waterborne and water washed diseases in slums. The poor women do not require spending more time to carry drinking water. The carrying drinking water is affecting on children's study and long term school achievements. Government must work on income generating activities. It will help to improve the income and asset holding to the poor people. Health care access is important in slums. Health care staff must provide contraceptive and its knowledge to poor women. It will help them to improve health of women and children. Health care staff must provide the prenatal and postnatal care to women in slums. They must help pregnant women to deliver the baby in health care facilities under the supervision of health professionals. All the above policies will certainly help to reduce the incidence of adult malnutrition in Mumbai Metropolitan Region.

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REFERENCES

Banerjee, B. and Mandal. O.N. *(*2005). An Intervention Study in Malnutrition Among Infants in a Tribal Community of West Bengal, Indian *Journal of Community Medicine* Vol. 30(1), January-March.

Chakraborty, R. and Bose, K. (2014). Defining malnutrition in India: how much is too little, how much is too much?, *Curent Science*, Vol. 1069(5): 670-672.

Daniel, Molla, Fekadu Mazengia, Dereje Birhanu (2013). Nutritional Status and Associated Factors Among Adult HIV/AIDS Clients in Felege Hiwot Referral Hospital, Bahir Dar, Ethiopia. *Science Journal of Public Health*. Vol. 1(1):24-31.

Deaton, Angus.Jean Dreze (2009). Food and Nutrition in India: Facts and Interpretations' February 14, Vol. XLIV(7):42-65.

Dewan, M. (2008). Malnutrition in Women, Stud. Home Comm. Sci., 2(1): 7-10

Gopalan, C. 2013. The changing nutrition scenario. Indian J Med Res Vol.138 (1): 392-397, September 2013.

Gillespie, S., Lawrence, H. (2003). *The Double Burden of Malnutrition in Asia: Causes, consequences and solutions*, Sage Publication, India.

Gordon, L. J., Compher, C., Dennis H., Mullin S, Mullin, G.E. (2013). Recognizing Malnutrition in Adults: Definitions and Characteristics, Screening, Assessment, and Team Approach**.** *Journal of Parenteral and Enteral Nutrition* , Volume 20(10):1-06.

Greene, W. (2003). Econometric Analysis Fifth edition, Pearson Education Private Ltd, Indian Branch, Delhi, India.

Jose, S. (2011). Adult Undernutrition in India: Is There a Huge Gender Gap? *Economic & Political Weekly*, July 16, 2011 Vol XLVI No. 29 pp 95-102.

Kiruba, S Varadharajan, Tinku Thomas, Anura V Kurpad, 2013. Poverty and the state of nutrition in India' Asia Pac J. Clin Nutr; Vol.22 (3):326-339.

Krishnaswamy, K., AN Naidu, MPR Prasad and Reddy, G.A. (2002). Fetal Malnutrition and Adult Chronic Disease, *Nutrition Reviews*, Vol. 60(5):S35–S39.

Mandali, S. Nirmalya Kumar Sinhai, Pradip Sawant, Subal Da and Kaushik Bose (2011). Anthropometric assessment of nutritional status among college women of midnapore, West Bangal, India. *Biological Anthropology*, Vol.1(1): 81-87 Oct-Dec 2011.

Opara, J. (2011). Malnutrition during Pregnancy among Child Bearing Mothers in Mbaitolu of Imo State, Nigeria, *Mediterranean Journal of Social Sciences* Vol. 2(6):91-96 November 2011.

Ojha, R. (2011). Prevalence of Malnutrition in India: A Disturbing Phenomenon', *Journal of Global Economy*, Vol.7 (2):146-157 April-June, 2011.

Turedi, A. Demir, C., Dilek, I. (2010). Assessment of Malnutrition in Adult Acute Leukemia Cases, *Asian Pacific Journal of Cancer Prevention*, Vol. 11(1): 703-707.