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Education and Household Income Determines Under Nutrition among Adults of Mumbai Metropolitan Region

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Education and Household Income Determines Under Nutrition among Adults of Mumbai Metropolitan Region

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Abstract- Malnutrition among adults is a major health issue in urban and rural parts of India. Malnutrition among adults reduces the economic productivity and such individual fall under poverty trap. This study finds the high severe malnutrition among male in Kalwa, Koparkhairne, Mankhurd and Rabale. The incidence of moderate malnutrition among male is found among male in Koparkhairane, Govandi and Chembur. Among female, it is found in Koparkhairne, Mulund, Kalwa and Mankhurd. At lower age, we found high incidence of malnutrition among adults. At lower education, adults have high incidence of malnutrition. As educational level of adults increases, the incidence of malnutrition declines fast. Similarly, at lower income, incidence of malnutrition is higher among adults. As income increases, the incidence of malnutrition among adults declines fast. A lower age at marriage, we found higher incidence of malnutrition among male and female. All adults consume milk, curd, pulses, vegetables, fruits and non-vegetarian food in diet but the incidence of malnutrition is higher. Few adults read magazines, watch cinema and television in slums of Mumbai Metropolitan Region. The physical, electronic and mobility related asset holding is very low among houses of malnourished adults. The logit regression model shows that adult malnutrition is positively co-related with sex, trip of women for drinking water, purification of drinking water, private electricity, bike, television, boy's preference and beans eaten in diet. Malnutrition among adults is negatively co-related with age, income, education, cooker, red magazine and curd in diet. There are alternative policies are required to reduce malnutrition among adults in Mumbai metropolitan Region. Government must provide training for self-employment to poor people. Banks must provide credit to poor people. They can start small business and increase the standard of living in region. Health care staff must visit to slums. They must treat adults with various illnesses. The women required special health care and treatment. The nurses, doctors and midwife must survey slums of region and counsel about pre-and post natal care, contraceptives and nutrition. State government must provide food under public distribution system at concessional rate. Such policies will certainly reduce the malnutrition among adults at certain extent. For economic growth of region, quality human resource is a basic requirement. Such policies will solve the malnutrition problem among adults and improve the quality of human resource for region.

Keywords: *health, water supply, sanitation.*

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I. INTRODUCTION

Under nutrition problem is widely viewed in all developing countries. The incidence of underweight and overweight are observed among adults in India. Mumbai Metropolitan Region is a financially and culturally well-developed region of India. Mumbai is emerging as global financial hub because it handles one third of the country's foreign trade. It is contributing maximum in terms of tax revenue to central government.

The growth of services sector such as finance, IT, telecom, tourism, entertainment, advertising, communication is higher. Mumbai city is a head quarter of important financial institutions such as RBI, BSE, NSE, SEBI and the corporate companies and multinational companies. Due to various business and employment opportunities, most of the unskilled and skilled people attract to region from all over India. Mumbai Metropolitan Region is migrants friendly because it provides cheap labor to the informal sector. The educated and skilled migrants do not find any employment and housing related issue in region. They easily integrate in region with locals and other migrants. The unskilled migrants are fit into menial or minor jobs in region. Such jobs are bottom line of economic pyramid of region. All Municipal Corporations provide basic civic amenities such as sanitation, water supply, health care, transport, electricity. Such civic infrastructure facilities are expected to improve the standard of living of population and promote economic growth of region. The growth of population in region has its implication on housing, solid waste, transportation, health care. The standard of living of population is continuously declining in region. It was expected that the economic growth of region will have more investment in civic amenities. The poor in the city would have provided housing, water supply, electricity and sanitation facilities. But due to inadequate and unaffordable housing, the slums are proliferated fast in the region and more people are living in various slums. The growing urbanization has led to the continuous increase in inequalities in region (Arokiasamy P. et.al. 2013). The slums are located at hill slopes under high tension power transmission lines, coastal side locations, low lying area including the

marshy zones, foot paths and near railway tracks. Slums are an integral part of region but government always notifying them as illegal structures. Therefore slums are avoided from providing all necessary infrastructure facilities. They are regularly demolished in region.

The urban poor in Mumbai Metropolitan Region of the slums place greater reliance on wage labour for their livelihood, daily purchase of food and non-food items. But the majority of urban slum dwellers do not have steady, well-paying or secure jobs. Due to low, uncertain and fluctuating income, women are supplementing income by involving themselves in income generating activities. They are also working longer hours with heavy manual labour. Public health care facilities in the urban area are heavily demanded, which results in longer waiting periods. The amount they pay for medicine and transport, besides losing their salary for the day proves expensive, thereby reducing the demand for healthcare through the substitution effect. Such households may rely more on self-medication, buying across the counter medication, traditional home remedies or simple inaction. The cost associated with the utilization of public health services includes direct and indirect monetary costs. The direct cost is low but the indirect (monetary and non-monetary) costs such as forgone income, the possibility of losing the job and costs associated with not performing normal activities, that is, paid and unpaid work, tending to children and transportation costs, are much higher for such mothers. The mother's opportunity cost of time seems to play more of a role than user fees although both waiting time and travel time are less elastic. The requirement of mothers to remain present at the work place often prevents them from using the public health facilities. Mothers cannot frequently visit such health facility because the characteristic of urban informal labour market is that the workers can easily be replaced, consequently the job can be lost through even an occasional absence. In addition, mothers involved in the causal labour market do not have time to prepare daily necessary meals, which are required for the family.

Urban slum dwellers do not have access to safe, regular and convenient supply of good quality water at an affordable cost. The people of *katcha* slums have to wait in a long queue, simply because water is available only for a few hours of a day. If the distance to the water tap from the house is considerable, then it is also an onerous and time-consuming task. Typically women and children are assigned to carry water, signifying a high level of drudgery and physical hardship. In order to make repeated trips, women suffer a high opportunity cost in terms of childcare, income generating activities and household chores. It is imperative to remain present on time at the work place; women either transfer their responsibility of carrying water to older sibling, or they wake up early in the

morning to collect water. Urban *kutch*a slum households are paying an extravagant price for water supply. The water in the *katcha* slums is unsafe for drinking. Reliable drinking water can be brought in but at a substantial cost. The amount drinking water, which a family uses, depends on average earning of family, the distance of the water and tap price of water and how it has to be carried. The low-income families are spending comparatively larger proportion of their incomes on water, that too just few liters of water every day. Irregularity of water supply forces the urban poor to store water in iron, plastic drums or large earthenware pots. Every day is a struggle to obtain just few liters of water for the whole family. Inadequate water is a major cause of water borne and water washed diseases. The water borne diseases occur by drinking contaminated water. Water washed diseases occur when there is a lack of water and sanitation in household hygiene. The *kutch*a slums do not have access to sanitation services. Those slums that do have public latrines, they are far away, overused and poorly serviced and rarely well maintained. Similarly, most of the latrines are badly constructed and therefore in dilapidated condition. Absence of universal sanitation and limited access to water supply is another cause of infections and diseases. The prevalence of common infectious diseases is undoubtedly much greater in poor of slums (Lunn Peter G. 2002). In Mumbai Metropolitan Region, the health status of children is in jeopardy due to rapid urbanisation, which has led to the creation of informal shack settlements on the outskirts of cities. Factors such as poverty, overcrowding and the possible contamination of food can have an impact on the health status of children (Theron, M. et.al 2006). The problem of urban slums is generally evaluated from the point of view of the non-slum urban population, which sees slums as a problem to be solved rather than as an integral and necessary part of the urban environment. In order to make Mumbai Metropolitan Region a modern world-class region, the government has urged the policy of slum eradication. Most of the squatters do not have residential proof such as ration cards, voting cards, adhar card etc. The government of Maharashtra and the Municipal Corporations have been consistently involved in giving notification for slum demolition. Therefore slum eviction is a constant threat to urban *katcha* slums. The massive demolition of *kutch*a slums by bulldozing them is a regular phenomenon in Mumbai Metropolitan Region. The poor of the urban *kutch*a slums have questionable access to basic facilities like water, electricity, health, sanitation, market, school and transportation, etc. This is because of the slum's unauthorized status, the municipal authorities have not provided any basic facilities. Depending on their purchasing capacity, the residents of the unauthorized areas buy these essential services from slumlords or

local leaders. People of *katcha* slums are also inclined to improve basic facilities and their houses. Thus given lower levels of income, any improvement program like water supply or sewage facility could lead to increase in the property value of such slums. Simultaneously they refrain from improvements since their slums can be destroyed at any time. The Municipal authorities have stopped all basic facilities to slum dwellers and their houses have been demolished. Such activity could make the poor people of any *katcha* slum to live in perpetual fear and tension.

II. DATA AND METHODOLOGY

For this study, we have surveyed 3004 households from kutchra slums in Mumbai Metropolitan Region. Total eighteen slum settlements were chosen for this study, from which five slum settlements are belonging to the central suburbs while the rest came from the eastern suburbs. Within each slum settlement and house, a questionnaire was administered. This study is conducted during January to February 2016. We analysed primary data in SPSS @20 and STATA @10 software. We used logit model to examine the socio-economic and demographic co-relation with child malnutrition in region.

a) 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.

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

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), moderate underweight (BMI 16- 16.99) and severe underweight (BMI <16). These three group are considered as Chronic Energy Deficient (CED). For overweight, the categories are as follows: Grade 1 (BMI 25.00-29.99), Grade 2 (BMI 30.00-34.99), Grade 3 (BMI 35-39.99) and Grade 4 (BMI > 40.00). Each of these adult malnutrition measures are 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.

b) Econometric model for malnutrition among adults

The adult's nutritional status in region is defined in terms econometric model as follows.

$$ANs = AP_{(MMR)}$$

It means nutritional status of adults is related to nutritional status of population in Mumbai Metropolitan Region.

$$ANs = f(S, E, D)$$

Adult nutritional status is depending upon the socio-economic status in slums.

Alternatively,

$$ANs = f(A, E, Y, Am, Nk, Fv, A)$$

Nutritional status of adults is depending upon age, education, income, age at marriage, nutritional knowledge, food eaten and assets in house.

$$Es = (I, P, S, HS, G, PG)$$

Educational status of adults is classified as illiterate, primary, secondary, high school, graduate and post graduate studied.

$$Vf = (M, P, C, P, F)$$

Vegetarian food eaten by adults consists of milk, pulses, vegetables and fruits

$$NVf = (E, C, M, F)$$

The non-vegetarian food eaten by adults mainly consists of eggs, chicken, meat and fish.

$$Nk = (RM, N, WT, Wc)$$

Nutritional knowledge is received by adults from reading magazines, reading newspaper, watching television and watching cinema.

$$Pa = (B, W, C, Sm)$$

A physical asset consists of bed, watch, cooker and sewing machine in house of adults in region.

$$Ea = (R, F, T, Fr, Te)$$

An electronic asset consists of radio, fan, television, fridge and telephone in house.

$$Ma = (Bi, C, B)$$

Mobility related assets consist of bike, car and bicycle.

c) Adult malnutrition in Mumbai Metropolitan Region

The nutrition status of adults is classified based on anthropometric measure. The Body Mass Index (BMI) is best estimator of classifying the nutritional status of adults. Such measure is used for adults of slums in Mumbai Metropolitan Region (MMR). The results are presented in the following table.

Table 1 : Area wise incidence of adult under nutrition (Per cent)

BMI/ Suburb	Below 15		15-16		16-18.5		18.5-25	
	M	F	M	F	M	F	M	F
Mankhurd	24.37	15.37	7.06	7.33	13.44	15.37	38.04	34.52
Govandi	18.59	15.16	9.75	3.85	18.37	15.84	36.96	35.75
Kalwa	33.22	18.85	6.85	6.67	19.52	13.56	26.71	35.17
Koparkhairne	28.72	19.74	10.64	9.21	17.02	14.47	31.91	34.87
Rabale	20.75	15.94	3.77	5.80	18.87	11.59	41.51	40.58
Turbe	15.13	11.62	8.55	2.02	14.47	11.62	35.53	44.95
Vashi	5.77	13.04	7.69	2.17	11.54	13.04	59.62	52.17
Ghatkopar	5.22	4.14	1.26	2.28	11.69	8.49	52.34	42.03
Reay road	9.68	14.29	6.45	3.57	12.90	17.86	54.84	53.57
Kurla	6.68	7.10	3.85	2.62	12.55	11.59	54.45	40.75
Chunabhatti	18.59	8.76	7.54	3.09	16.58	12.89	46.23	39.18
Byculla	6.67	7.81	2.50	5.47	16.67	11.72	50.83	39.06
Thane	5.90	7.58	2.12	2.48	7.87	7.58	41.00	35.95
Airoli	4.49	1.89	4.49	5.66	6.74	12.26	47.19	50.00
Juinagar	11.11	14.86	4.94	4.05	22.22	8.11	38.27	40.54
Chembur	6.76	10.11	9.46	5.62	18.92	17.98	44.59	34.83
Mulund	11.11	11.23	4.09	5.88	8.19	10.16	36.84	30.48
Bhandup	6.96	7.53	2.45	1.91	9.02	6.57	47.04	36.20
Total	12.36	10.34	4.69	3.83	12.75	10.94	43.56	37.80

Source: Primary data

A mal-nourished individual could be either affected currently with respect to some existing challenge, or could imply a reduced potential for dealing with some future situation such as an increased demand for work, for resisting an infection, for a psychosocial response etc. That is to say malnutrition can result in either a sub optimal response to a current stress or to an increased risk of failure at some future time (Payne, Philip and Peter Cutler 1984). Incidence of severe malnutrition among male is 33.22 per cent in Kalwa. The high incidence of severe malnutrition among female is 19.74 per cent in Koparkhairane. The lowest incidence of severe malnutrition among male (4.49 per cent) and female is found (1.89 percent) in Airoli. The moderate high incidence among male is 10.64 percent and among female it is 9.21 percent in Koparkhairane. The lowest moderate malnutrition incidence among male is found in Ghatkopar (1.26 per cent) and among female it is 1.91 percent in Bhandup. The high mild incidence of malnutrition is found among male (22.22 percent) in Juinagar. Among female, it is 17.98 percent in Chembur. The lowest mild incidence of malnutrition among male is found in Airoli (6.74 percent). Among female, it is 6.57 percent. Nutrition embodies a central role in human well-being. It is both an essential element of, and also a

critical input to other aspects of, well-being. Adequate nutritional attainment is essential equally for men and women. However, women's nutrition assumes additional importance due to its critical but complex association with their well-being and the implication it has for human development. Yet, it is women's nutrition - to that extent their well-being - which has often been subsumed under the umbrella of "family welfare" Under-nutrition would denote a deprivation of the basic aspect of well-being: the lack of freedom to lead a minimally healthy life. The implications that women's malnutrition have for human development are multiple and cumulative (Jose, Sunny and K. Navaneetham 2008). We observed that it is the custom that husbands are given priority in intra-household food distribution regardless of the amount of food available in the household. During seasons of acute food shortage within the household, women may stay without food as they give priority to their husband and children. Even during times of food surplus in the household, women usually eat their meals after their husband. In most cases, this may not be due to nutritional ignorance but often relates to tradition and to power relations within the household. Women with less influence or power within the household will be less likely to procure fair food distribution within the

household (Regassa, Nigatu and Barbara J. Stoecker 2012). We can easily find the intra-household food distribution through BMI.

Table 2 : The incidence of obesity among adults (Per cent)

BMI/Suburb	25-30		30-35		35-40		40<	
	M	F	M	F	M	F	M	F
Mankhurd	10.93	13.00	3.19	8.27	1.14	3.31	1.82	2.84
Govandi	11.34	16.29	3.17	7.24	0.23	2.26	1.59	3.62
Kalwa	7.53	13.33	2.05	7.13	2.05	1.84	2.05	3.45
Koparkhairne	5.32	11.84	5.32	3.95	0.00	0.00	1.06	5.92
Rabale	13.21	20.29	1.89	1.45	0.00	1.45	0.00	2.90
Turbe	17.11	16.67	5.92	8.08	0.66	3.03	2.63	2.02
Vashi	7.69	10.87	5.77	6.52	1.92	0.00	0.00	2.17
Ghatkopar	15.47	21.53	8.09	12.63	2.88	4.35	3.06	4.55
Reay road	12.90	3.57	0.00	3.57	0.00	3.57	3.23	0.00
Kurla	12.55	17.20	3.85	11.21	3.04	5.23	3.04	4.30
Chunabhatti	7.54	16.49	1.01	12.89	2.51	4.64	0.00	2.06
Byculla	15.83	15.63	3.33	16.41	2.50	3.13	1.67	0.78
Thane	21.79	24.31	8.02	7.97	4.08	5.62	9.23	8.50
Airoli	19.10	16.04	10.11	8.49	4.49	3.77	3.37	1.89
Juinagar	14.81	13.51	2.47	10.81	1.23	5.41	4.94	2.70
Chembur	9.46	14.61	8.11	6.74	1.35	3.37	1.35	6.74
Mulund	18.71	19.79	7.02	10.16	2.92	6.42	11.11	5.88
Bhandup	17.27	24.49	7.47	9.44	2.71	3.70	7.09	10.16
Total	14.53	18.72	5.49	9.13	2.35	3.83	4.27	5.39

Source: Primary data

Incidence of obese-1 is high among male (19.10 per cent) in Airoli. Among female, it is 24.49 per cent in Bhandup. The lowest obese –I incidence of malnutrition is found among male in Kalwa (7.53 per cent). Among female, it is 3.57 per cent in Reay Road. The highest obese-II incidence among male is 11.10 percent in Airoli. It is highest among female in Byculla (16.41 percent). The obese-II malnutrition among male is not found in Reay Road. It is lowest among female as 1.45 per cent. The highest incidence of obese-III among male is found as 4.49 percent in Airoli. It is 6.42 per cent among female in Mulund. The obese –III incidence among male is not found in Rabale and Koparkhairane. It is also not found among female in Koparkhairane and Vashi. The Obese-IV incidence of malnutrition is found among male in Mulund as 11.11 per cent. Among female, it is 10.16 per cent. The incidence of Obese-IV is not found among male in Rabale and Vashi. Among female, it is nil in Reay road.

d) Age wise incidence of malnutrition among adults

There is relationship between adult age and malnutrition. The education, assets effects on the health status of adults.



Table 3 : Age wise classification of adult malnutrition (Per cent)

BMI /Age wise(years)	Sex	<15	15-16	16-18.5	18.5-25	25-30	30-35	35-40	40<
15-25	F	4.29	2.71	12.63	43.75	20.27	9.34	2.90	4.10
	M	7.36	4.56	16.29	44.04	13.31	6.80	2.14	5.49
25-35	F	1.44	1.71	6.56	44.20	24.71	12.76	4.94	3.68
	M	2.05	1.36	7.99	60.33	20.47	6.14	1.07	0.58
35-45	F	0.54	1.62	4.14	50.00	22.48	11.33	5.40	4.50
	M	0.78	1.18	9.02	62.55	16.27	5.69	3.53	0.98
45-55	F	1.02	1.02	4.57	29.95	29.95	17.77	8.63	7.11
	M	1.04	0.35	10.07	60.07	19.44	4.51	2.08	2.43
55-65	F	0.00	4.55	10.61	13.64	42.42	18.18	1.52	9.09
	M	1.65	1.65	8.26	52.07	23.97	9.92	2.48	0.00
65<	F	6.45	3.23	3.23	38.71	9.68	32.26	3.23	3.23
	M	0.00	5.00	15.00	50.00	20.00	10.00	0.00	0.00
Total	F	2.57	2.17	8.82	43.50	22.86	11.56	4.23	4.29
	M	3.59	2.40	11.35	54.52	17.28	6.32	2.01	2.53

Source: Primary data

The incidence of severe malnutrition among below 15 age group male is 7.36 per cent. Among female, the incidence of severe malnutrition is 6.45 per cent in above 65 age group. The incidence of moderate malnutrition among male above 65 years is 5 per cent. Among 55-65 age group female, the incidence of severe malnutrition is 4.55 per cent. The incidence of mild malnutrition among male in 15-25 age group is 16.29 per cent. Among 15-25 age group, the mild malnourished female are 12.63 per cent. In 15-25 age group, nearly 44.04 per cent male have normal BMI. Above 65 age group, 38.71 per cent female have normal BMI. Nearly 23.97 per cent male of 55-65 age group are obese-1. The 29.95 per cent female of 45-55 age group are obese-1. The obese-2 male, have 10 per cent of incidence in above 65 age group. The female in this age group have 32 per cent incidence of obese 2. Incidence of obese-3 among male is 3.53 per cent in 35-40age group. Among female in this category, it is 8.63 per cent of 45-55 age group. The obese-4 among male in 15 -25 age group is 5.49 per cent. Among female, the obese-IV incidence is 4.10 per cent in 15-25 age group. Adult malnutrition leads to assets depletion, loss of current income and pauperising medical ex-penditure. In such households participation in the labour force tends to be unstable, daily incomes fluctuate highly, often being exceeded by food expenditure and pitching the household into chronic debt. Survival tactics included fasting and foregoing meals, the splitting of the household, shedding of the old, etc. Patterns of household anthropometry showed evidence of both inadequate food entitlements at the household level and high disease incidence. Third, severe malnutrition in the non-poor was acute rather than chronic and revealed diverse nutritional aetiologies, often associated with maternal illness and with bottle feeding or delayed weaning (Barbara Harriss et.al 1990).

e) Educational attainment and malnutrition incidence

Education helps male and female to understand the nutritional content of food which he/she is eating. Education helps to understand the nutritional content of food she/he eating. Education also helps to understand the self-health status. Educated person can immediately approach to health care facility. He/she can easily interact with doctors, community members, relatives and household members. Less education is a problem and it ultimately leads to malnutrition. A less educated woman does not understand physical growth of the child. The education helps to use assets, household resources, community resources in an efficient manner. Education helps to improve health status of mother and children. A highly educated person can work few hours and earn enough income for family.

Table 4 : Educational status and malnutrition incidence (Per cent)

BMI/Education	Sex	>15	15-16	16-18.5	18.5-25	25-30	30-35	35-40	40<	Total
Illiterate	M	42.11	40.26	54.62	59.29	57.48	56.5	51.68	42.28	56.17
	F	34.09	35.21	50.00	56.60	53.48	39.89	51.61	30.00	51.99
Primary	M	10.53	10.39	9.25	7.42	8.41	8.22	9.40	9.40	8.23
	F	6.82	14.08	9.47	7.36	9.42	10.64	20.97	5.00	8.51
secondary	M	42.11	46.75	33.82	29.75	31.77	32.63	37.58	45.64	32.65
	F	53.03	42.25	37.63	32.10	32.96	37.23	25.81	51.25	34.74
Higher secondary	M	5.26	1.30	2.31	2.87	2.10	1.86	1.34	2.68	2.49
	F	4.55	4.23	2.37	2.98	2.26	9.04	1.61	12.50	3.46
Graduate	M	0.00	1.30	0.00	0.60	0.25	0.53	0.00	0.00	0.40
	F	0.76	4.23	0.53	0.91	1.69	3.19	0.00	1.25	1.20
Post graduate	M	0.00	0.00	0.00	0.07	0.00	0.27	0.00	0.00	0.06
	F	0.76	0.00	0.00	0.06	0.19	0.00	0.00	0.00	0.10

Source: Primary data

We found 42.11 per cent male and 34.09 per cent female are illiterate but they suffered from severe malnutrition. The 59.29 per cent male and 56.60 per cent female are in normal BMI but they are illiterate. Nearly 42.28 per cent male and 30 per cent female are illiterate but they are obese IV category malnourished. Total 10.53 per cent male and 6.82 per cent female are primary studied but they are severely malnourished. There are only 7.42 per cent male and 7.36 per cent female are in normal BMI category but they are primary studied. We also found 9.4 per cent male and 5 per cent female are primary studied but they are in Obese-IV category.

The 42.11 per cent male and 53.03 per cent female are primary studied but they are in obese IV category. The 42.11 per cent male and 53.03 per cent female are secondary studied but they are severely malnourished. The 29.75 per cent male and 32.10 per cent female are secondary studied but they have normal BMI. Nearly 45.64 per cent male and 51.25 per cent female are secondary studied but they are suffered from obese-IV malnutrition category. The 5.26 per cent male and 4.55 per cent female have studied higher secondary but they are severely malnourished. There are 2.87 per cent male and 2.98 per cent female are in normal BMI but they are higher secondary school studied. The 2.68 per cent male and 12.50 per cent female are higher secondary studied but they are suffered from the obese-IV category. The 0.60 per cent male and 0.91 per cent female are in normal BMI category and they are graduates. We have not found graduate male and female with obese IV malnutrition category. We have not found mild and moderate malnutrition incidence among male and female with post-graduation education. It is clear that, the incidence of the severe, moderate and mild under-nutrition and obese I to IV clearly related with less education. As educational achievements among male and female increase the malnutrition incidence

automatically declines. We found very less incidence of malnutrition with post- graduation among adults.

f) Household income and malnutrition incidence among adults

Household income is a sole determinant of nutritional status of adults. High income is an important aspect for good nutritional status of adults. A high income person always visit a doctor explain the health problem, buy reliable medicine. He/she buys fresh vegetables fruits and gain nutrition via knowledge. She/he can keep children in good health status through buying number of health inputs. But the irregular and low income does not help households to invest in health. Health care is not received due to high direct and indirect cost to family. Therefore income is the determinant of health status of household members.



Table 5 : Malnutrition incidence and household monthly income (Per cent)

BMI/Income (Rs.)	Sex	>15	15-16	16-18.5	18.5-25	25-30	30-35	35-40	40<	total
0	F	0.00	0.00	0.00	0.07	0.25	0.53	0.00	0.67	0.17
	M	0.00	0.00	0.00	0.06	0.00	0.53	0.00	0.00	0.06
1-5000	F	27.37	26.92	24.86	22.41	20.52	24.67	24.16	18.79	22.61
	M	18.94	27.78	28.68	21.42	16.20	17.02	24.19	10.00	20.95
5000-10000	F	42.11	55.13	60.98	63.75	66.38	61.80	61.07	65.10	63.04
	M	64.39	52.78	58.42	63.30	67.42	63.83	53.23	85.00	63.60
10001-15000	F	13.68	11.54	9.54	10.97	10.26	11.14	13.42	12.08	10.92
	M	10.61	15.28	10.00	11.81	11.49	14.36	19.35	5.00	11.69
15001-20000	F	12.63	3.85	2.89	2.34	1.73	1.06	0.67	2.68	2.37
	M	5.30	2.78	1.84	2.56	3.77	1.60	3.23	0.00	2.69
20001-25000	F	4.21	2.56	1.45	0.27	0.74	0.80	0.00	0.67	0.71
	M	0.76	0.00	0.79	0.67	1.13	2.13	0.00	0.00	0.81
25001-30000	F	0.00	0.00	0.29	0.13	0.00	0.00	0.00	0.00	0.09
	M	0.00	1.39	0.26	0.12	0.00	0.53	0.00	0.00	0.16
>30000	F	0.00	0.00	0.00	0.07	0.12	0.00	0.67	0.00	0.09
	M	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.03

Source: Primary data

Income and malnutrition incidence has correlation. Higher income families do not have incidence of malnutrition. They easily fulfil their basic requirement from income. The 27.37 percent female and 18.94 percent male have family monthly income between Rs. 0-5000 but they are severely malnourished. The 22.41 percent female and 21.42 percent male have Rs. 0-5000 income and they are in normal BMI category. The 18.79 percent female and 10 percent male have Rs.0-5000 monthly income but they suffered from obese –IV category. The 42.11 percent female and 64.39 percent male have Rs.5000-10000 monthly income but they are severely malnourished. The 63.75 percent female and 63.30 percent male have monthly income of Rs.5000-10000 and they have normal BMI. Nearly 61.80 percent female and 63.83 percent male have Rs.5000-10000 monthly income but they are obese-II. Total 65.10 percent female and 85 percent male have monthly income of Rs.5000-10000 monthly but the male and female are obese-IV. The 13.68 percent female and 10.61 percent male have Rs.10000-15000 monthly income but they suffered from severe malnutrition. The 10.97 percent female and 11.81 percent male have normal BMI. There are 13.42 percent female and 19.35 percent male have Rs.10000-15000 monthly income but they suffered from obese III malnutrition. The 12.63 percent female and 5.30 percent male have income of Rs. 15000-20000 but they are severely malnourished. The 2.34 percent female and 2.56 percent male have normal BMI but their monthly income is between Rs.15000-20000. We have not found the obese III malnutrition

incidence with monthly income of Rs.20000-25000. Similarly, we have not found the severe malnutrition, obese-I, III and IV incidence with monthly income of Rs.25000-30000. The incidence of malnutrition among adults is not found with above Rs.30000 monthly income. It is clear that higher income wipe out the incidence of malnutrition among adults. Higher income is most important for families to reduce the incidence of malnutrition among adults in Mumbai Metropolitan Region.

g) Age at marriage and malnutrition incidence

Marriage is a significant event in any individuals' life. The age at marriage for female is significant factor because it is not only affecting on her own health but health of child in future. In the long term, the child's health status is depending upon the health status of mother. Therefore higher age at marriage helps to take care of self as well as child health. The physical growth and development of women gets affected due to child bearing. Therefore the growth process of mothers is affecting on the children's growth. Therefore higher age at marriage is an advantage for next generation.

Table 6 : Age of marriage and incidence of malnutrition among male and female (Per cent)

BMI/ Age of marriage (Years)	>12		13-18		18-23		23-28		28.1-33		33<	
	F	M	F	M	F	M	F	M	F	M	F	M
>15	5.26	2.27	71.58	64.39	22.11	31.82	0.00	1.52	1.05	0.00	0.00	0.00
15-16	1.28	2.78	74.36	63.89	20.51	31.94	3.85	1.39	0.00	0.00	0.00	0.00
16-18.5	2.02	3.16	67.63	59.47	27.46	33.95	2.60	2.63	0.29	0.53	0.00	0.26
18.5-25	2.21	1.76	67.38	62.65	26.20	31.51	3.68	3.83	0.47	0.24	0.07	0.00
25-30	1.85	2.45	67.37	69.49	28.06	25.05	2.22	2.45	0.37	0.56	0.12	0.00
30-35	2.39	1.06	67.37	69.15	27.06	27.13	2.92	1.60	0.27	1.06	0.00	0.00
35-40	2.01	1.61	75.17	74.19	21.48	24.19	1.34	0.00	0.00	0.00	0.00	0.00
40<	3.36	1.25	77.18	80.00	18.12	17.50	1.34	1.25	0.00	0.00	0.00	0.00
Total	2.23	2.04	68.42	64.62	26.06	29.94	2.86	3.01	0.37	0.36	0.06	0.03

Source: Primary data

Nearly 71.58 percent female and 64.39 per cent male are married in 13-18 years of age group but they are severely malnourished. We have not found obesity incidence if they are married above 33 years of age. The 74.36 per cent female and 63.89 percent male have married in 13-18 age group but they suffered from mild malnutrition. We have not found any incidence of obesity if they have married after 28 years. We found that 67.38 percent female and 62.65 per cent male are in normal BMI category but they have got married in 13-18 age groups. The 26.20 percent female and 31.51 per cent male are married in 18-23 age group and they have normal BMI. It is lowest incidence of malnutrition among adults as compare to other categories. Now also most of the marriages are taking place before 18 years. The parents and youths do not measure their weight and height at the time of marriage. Therefore it is difficult to measure nutritional status at the time of marriage. There

are 67.37 per cent female and 69.49 per cent male married in 13-18 age group but they fall under the obese -I category. Around three fourth of male and female got married in 13-18 age group but they fall under obesity III. We have not found the obesity III category male and female in 28 and above age at marriage. Similarly we have found 77.18 per cent female and 80 per cent male got married in 13-18 age group but they suffered from obesity IV category. We have not found obesity IV malnutrition incidence if they got married above age of 28 years.

h) Malnutrition and food eaten by adult members

Knowledge of nutrition helps adults to consume right food and get nutrition's for body. There are vitamins and proteins required for body. For women, nutritional knowledge helps to own health as well as child health.

Table 7 : Nutritional knowledge and food eaten among adults (Per cent)

BMI	Know nutrition		Milk		Curd		Pulses	
	F	M	F	M	F	M	F	M
>15	12.11	18.33	63.16	73.48	47.37	58.33	86.32	87.88
15-16	13.85	15.56	73.08	62.50	58.97	48.61	91.03	81.94
16-18.5	12.89	15.26	65.03	59.74	48.55	42.63	89.88	88.16
18.5-25	23.81	22.49	69.32	62.80	56.89	47.42	90.64	90.76
25-30	12.72	12.26	66.87	66.48	55.75	57.44	94.07	95.48
30-35	12.92	12.66	61.01	69.68	50.13	56.38	92.31	89.89
35-40	13.36	13.23	67.11	63.93	58.39	59.02	93.29	96.72
40<	12.68	11.25	65.10	75.00	52.35	66.25	97.32	92.50
Total	13.26	13.11	67.08	64.26	54.73	50.31	91.83	91.03

Source: Primary data

Nearly 23.81 per cent female and 22.49 per cent male have knowledge of nutrition and they are in normal BMI. Milk mainly contains vitamin A and consumption of milk helps to improve the nutritional status. It improves the work capacity of adults. Most of the families consume milk in diet or drink milk. There are female (63.16 percent) and male (73.48 percent) eat milk in diet but they are severely malnourished. The female (73.08 percent) and male (62.50 percent) eat milk but they are moderately malnourished. The 65.10 percent female and 75 percent male are eating milk but they are obese-IV. We found 69.32 percent male and 62.80 percent female eat milk and they have normal BMI. Curd consumption is good because it contains calories and vitamin A. It is good for the eye sight and body. Adult members prepare curd at home or they buy from shops. The regular consumption of curd reduces the incidence of malnutrition among adults. Nearly 47.37 per cent male and 58.33 percent female eat curd in diet but they are severely malnourished. The 58.97 percent female and 46.61 percent male are eating curd in diet but they are moderately malnourished. The 56.89 percent female and 47.42 percent male eating curd but they have normal BMI. There are 52.35 percent female

and 66.25 percent male are eating curd and they are in obese- IV category. Pulses are the rich source of vitamins and nutrition. The regular consumption of pulses reduces the chance of malnutrition. But it is depending on the income of the family. Most of the families have lower income and they cannot afford to buy pulses. There are 86.32 percent female and 87.38 percent male are severely malnourished but they are eating pulses in diet. There are 91.03 percent female and 81.94 percent male are eating pulses but they are moderately malnourished. Nearly 90.64 percent female and 90.76 percent male are eating pulses and they are in normal BMI category. The 97.32 percent female and 92.50 percent male are eating the pulses but they are in obese IV category.

j) Consumption of fruits and vegetables and malnutrition incidence

The vegetables and fruits contain good source of different nutrition. Fresh vegetables are always preferred in diet. They improve the nutritional status of adults. We asked consumption of fruits and vegetables in the diets.

Table 8 : Vegetable consumption, fruits eaten and malnutrition incidence (Per cent)

BMI	Vegetables		Beans		Fruits	
	F	M	F	M	F	M
>15	100	100	43.16	56.06	54.74	65.91
15-16	97.44	98.61	58.97	43.06	66.67	58.33
16-18.5	99.13	98.95	49.42	41.58	56.65	47.89
18.5-25	99.20	99.03	54.55	45.59	61.34	51.06
25-30	98.39	99.44	53.89	58.38	58.79	61.02
30-35	98.14	97.87	50.13	57.45	53.58	60.64
35-40	99.33	100.00	57.05	57.38	63.09	59.02
40<	100.00	98.75	52.35	65.00	53.69	70.00
Total	98.91	99.06	53.22	49.14	59.14	54.42

Source: Primary data

Beans are the good source of vitamins and protein. Beans is green vegetable and helps to get good health status. The 43.16 percent female and 56.06 percent male are eating beans but they are severely malnourished. The 58.97 percent female and 43.06 percent male are eating beans but they are moderately malnourished. The 54.55 percent female and 45.59 percent male are eating beans and they have normal BMI. The 52.35 percent female and 65 percent male are eating beans but they are in obese-IV category. Different vegetables contain different kinds of vitamins and protein. The household members must eat the fresh vegetables because they contain valuable source of energy and vitamins. But again the lower income does not support to buy the fresh vegetables and they are

expensive source of energy. They do not buy fresh vegetable which is again affects on their body. All male and female are eating vegetables but they are severely malnourished. All the male and female eat vegetables and they have normal BMI. It is true with all the categories. All male and female said that they eat all vegetables but still they suffer from under nutrition and over nutrition.

Fresh fruits are rich source of vitamins. Such vitamins are necessary requirement of human body. But fresh fruits are expensive. The family size is big and the monthly income is low. Therefore it is difficult to buy the fresh fruits to all members. It effects on the nutritional status of adults. The 54.74 per cent female and 65.91 per cent male are eating fruits but they suffer from

severe malnutrition. The 66.67 per cent female and 58.33 per cent male eat fruits but they are suffering from the moderate malnutrition. The 56.65 per cent female and 47.89 per cent male are eating fruits in diet but they suffer from the mild malnutrition. Nearly 61.34 per cent

female and 51.06 per cent male eat fruits in diet and they are in normal BMI category. The 63.09 per cent female and 59.02 per cent male are eating fruits but they are in obese-III category.

j) *The malnutrition among adults and consumption of non-vegetarian food*

Table 9 : Consumption on non-vegetarian food and malnutrition incidence (Per cent)

BMI/Non-veg	Eggs		Chicken		Meat		Fish	
	F	M	F	M	F	M	F	M
>15	54.74	70.45	55.79	71.76	55.79	68.94	56.84	70.45
15-16	65.38	61.11	66.67	61.11	66.67	55.56	69.23	59.72
16-18.5	59.25	52.89	59.54	54.47	59.25	49.21	59.30	53.42
18.5-25	64.30	55.56	64.41	55.68	61.90	53.98	63.97	56.06
25-30	61.06	64.60	60.94	63.65	59.21	62.15	60.72	63.28
30-35	57.03	62.23	56.50	64.89	55.17	61.70	56.53	64.36
35-40	63.76	57.38	63.76	57.38	62.42	59.02	63.09	59.02
40<	55.03	71.25	56.38	71.25	55.03	67.50	56.38	68.75
Total	61.62	58.40	61.72	58.71	59.96	56.39	61.52	58.57

Source: Primary data

Eggs are the good source of protein to adults. Protein is directly related to work capacity and productivity. But lower consumption of eggs does not help to get more protein and improve work capacity. Eggs are expensive and it is not feasible to buy every day eggs for all family members. The 54.74 per cent female and 70.45 per cent male are eating the eggs but they are severely malnourished. The 65.38 per cent female and 61.11 per cent male are eating eggs but they are moderately malnourished. The 64.30 per cent female and 55.56 per cent male eat eggs and they are in normal BMI category. The 63.76 per cent female and 57.38 per cent male are eating eggs but they are in obese- III category. Most of the non-vegetarian household members eat chicken. It is source of protein and vitamins. It improves the health and work productivity. But chicken is expensive source of protein. The 55.79 per cent female and 71.76 per cent male are eating chicken but they are severely malnourished. The 66.67 per cent female and 61.11 per cent male are eating chicken but they are eating eggs. The 64.41 per cent female and 55.68 per cent male are eating chicken and they have normal BMI. The 60.94 per cent female and 63.65 per cent male are eating chicken but they are obese-I malnourished. The 56.38 per cent female and 71.25 per cent male are eating chicken but they are obese IV category. Some families also eat meat once in a week. It is good source of nutrition. But occasionally households eat meat. The 55.79 per cent female and 68.94 per cent male are eating meat but they are severely malnourished. The 66.67 per cent female and 55.56 per cent male are eating meat but they are moderately malnourished. The 61.90 per cent female and 53.98 per cent male are eating meat and they have normal BMI. The 59.21 per cent female and 62.15 per

cent male are eating meat but they are obese I. The 55.17 per cent female and 61.70 per cent male eat meat but they are obese-II category. Fish is a source of calories, vitamins and protein. Most of the poor families eat fish but they eat once in a week. Good and fresh fish improves stock of protein in body. Therefore it helps to improve nutritional status of adults. The 56.84 per cent female and 70.45 per cent male are eating fish but they are severely malnourished. The 63.97 per cent female and 56.06 per cent male are eating fish and they have normal BMI. The 56.38 per cent female and 68.75 per cent male are eating fish and they are obese IV category. The non-vegetarian food is consumed because of taste and nutrients requirement (Solomons, Noel W. 2007).

k) *Malnutrition incidence and knowledge gain by adults*

Exposure to media and newspapers, magazines is important for adults. It certainly improves nutritional knowledge and reduces the malnutrition among adults. But access to media is very low among the adults in slums.



Table 10 : Exposure to mass media and incidence of malnutrition among adults (Per cent)

BMI/Mass media	Read magazine		Watch cinema		Watch Television	
	F	M	F	M	F	M
>15	1.05	6.82	7.37	21.21	47.37	54.55
15-16	3.85	2.78	8.97	15.28	56.41	52.78
16-18.5	4.34	3.95	8.67	11.84	54.91	55.29
18.5-25	6.28	7.34	12.96	7.17	69.33	71.13
25-30	2.84	2.26	6.80	4.90	68.48	62.71
30-35	3.71	2.66	6.63	4.79	61.54	68.09
35-40	5.37	1.61	6.04	0.00	67.11	69.35
40<	2.68	1.25	3.36	1.25	61.74	61.25
Total	3.77	3.24	7.77	7.70	60.48	68.19

Source: Primary data

The different magazines give knowledge of different subjects. For health of mother and child, few magazines are important. But it depends on adults which magazines they prefer and read. But reading magazines are the good source of information. Reading magazine helps to improve the knowledge. Most of the time magazines are good source of nutritional knowledge. The choice of magazine is done by adult members. But the poor families do not have money to buy magazines. They do not have knowledge to buy magazine and read relevant topic of health. Only 11.05 per cent male and 16.82 per cent female are reading magazine but they are severely malnourished. The 4.28 per cent female and 3.34 per cent male are reading magazine and they have normal BMI. The 2.68 per cent female and 1.25 per cent male read magazine but they are suffered from obese IV category. There are 4.28 per cent female and 3.34 per cent male read magazine and they are in normal BMI category. The 2.68 per cent female and 1.25 per cent male read magazine but they are obese IV. Watching television regularly helps to get maximum knowledge. It is related to health care, child growth, nutrition etc. Most of the poor people do not know the various programs on television. Firstly do not

have electricity connection. Their income is low therefore they cannot buy television. They do not have time to watch programs. The 47.37 per cent female and 54.55 per cent male are watching television but they are severely malnourished. The 59.33 per cent female and 61.13 per cent male are watching television and they have normal BMI. Watching cinema in cinema hall is a luxury for the poor families. But most of the poor families are involved in daily wage earning. They cannot afford to buy tickets and watch cinema in the theatre. They do not have time also. The 7.37 per cent female and 21.21 per cent male are severely malnourished. The 8.96 per cent female and 7.17 per cent male are watching cinema but they have normal BMI. The 3.36 per cent female and 1.25 per cent male are obese- IV category and they are watching cinema.

l) Malnutrition incidence and household assets

Household assets are important for the family members. As income increases, the household assets also increase. But households in the slums are poor. Therefore they do not have different required assets in their house. It effects adversely on their socio-economic status.

Table 11 : Bed and electricity in house and malnutrition incidence (Per cent)

BMI/Assets	Bed		Electricity		Watch		Cooker	
	F	M	F	M	F	M	F	M
>15	8.42	15.91	84.21	85.61	7.37	17.42	40.00	52.27
15-16	5.13	6.94	87.18	84.72	8.97	6.94	46.15	38.89
16-18.5	12.14	10.26	85.55	84.21	11.27	11.05	43.64	35.00
18.5-25	24.52	24.47	85.63	88.63	24.78	21.67	56.19	53.89
25-30	20.40	21.85	90.61	89.45	15.82	16.01	45.98	47.65
30-35	15.65	28.72	87.80	81.91	10.61	21.81	41.11	43.62

35-40	12.75	19.35	83.22	80.65	12.75	24.19	46.31	32.26
40<	8.72	21.25	75.17	65.00	7.38	27.50	28.19	36.25
Total	15.07	16.25	86.45	86.83	13.49	13.75	44.41	43.24

Source: Primary data

Due to poverty, poor households cannot buy the cooker. It helps in food preparation and save fuel. The 40 per cent female and 52.27 per cent male have cooker in house but they are severely malnourished. The 46.19 per cent female and 43.89 per cent male have cooker in house but they are in normal BMI. The 28.19 per cent female and 36.25 per cent male have cooker in house but they are in obese IV category. Bed at home helps to relax household members. But they do not have proper space to keep bed. The houses are illegal in slums. Therefore purchase of bed is not possible. The 8.42 per cent female and 15.91 per cent male are

severely malnourished. The 7.37 per cent female and 17.42 per cent male have watch but they are severely malnourished. The 7.38 per cent female and 27.50 per cent male have watch in house but they are in obese IV category. Most of the houses do not have electricity connection. They buy electricity from private sources. The private electricity connections are given by the local leader and charge units at higher rate. Due to lack of meters, the poor are paying high price for the electricity. The 84.21 per cent female and 85.61 per cent male have electricity in house but they are severely malnourished.

Table 12 : Electronic items and malnutrition incidence (Per cent)

BMI/Assets	Radio		Sewing machine		Fan	
	F	M	F	M	F	M
>15	0.00	0.76	0.00	0.00	84.21	86.36
15-16	0.00	0.00	0.00	0.00	88.46	84.72
16-18.5	0.58	0.26	0.58	0.53	86.42	83.68
18.5-25	1.00	2.79	1.60	0.18	85.89	89.42
25-30	0.74	1.13	0.12	0.00	90.73	89.27
30-35	0.80	2.66	0.27	0.53	88.33	83.42
35-40	0.67	1.61	0.00	0.00	85.23	83.87
40<	0.00	2.50	0.00	0.00	78.52	65.00
Total	0.77	0.94	0.37	0.19	86.99	87.34

Source: Primary data

Ownership of radio is useful to listening songs and programs of different nature. But the poor families do not have the money to buy radio. Secondly they cannot spend more time in listening songs and programs. We found that one per cent female and 2.79 per cent male have radio and they are in normal BMI category. We have not found the ownership of radio with house of moderate malnutrition among adults. There are 85.89 per cent female and 89.42 per cent male are having normal BMI and they have fan in house. The 78.52 per cent female and 65 per cent male are in obese IV category. Poor families can earn income by stitching cloths and stich cloths of others. It reduces the family expenditure on the stitching. We have not found swing machine with mild and moderate malnourished male and female. The obese III and IV category male and female also not found the swing machine in house. Fan is a basic requirement of family. But lack of electricity and money does not support households to buy the fan in house. The (84.21 per cent) female and male (86.36 per cent) having fan in house but they are

severely malnourished. The (85.89 per cent) female and (89.42 per cent) male are having normal BMI and they have fan in house. The 78.52 per cent female and 65 per cent male have fan but they are in obese- IV category. There are 17.89 per cent female and 26.51 per cent male are having television in house but they are severely malnourished. The 12.08 per cent female and 4.84 per cent male have television in house but they are suffered from Obese-III category. Television in house is important to see the current news, health related programs and talk shows. But most of the households are poor. They cannot afford to buy the television. Electricity connection is not regular. Households are kuttcha. Therefore television is not purchased by poor households. The sewing machine is not found with obese-III and IV category malnourished male and female.

Table 13 : Television and fridge and incidence of malnutrition among adults (Per cent)

BMI/Assets	Television		Refrigerator		Telephone	
	F	M	F	M	F	M
>15	17.89	26.51	0.00	0.00	4.21	5.30
15-16	23.08	25.00	2.56	0.00	16.67	11.39
16-18.5	23.70	17.37	1.16	0.53	12.72	13.84
18.5-25	27.18	28.10	4.87	4.16	18.02	16.20
25-30	12.86	12.81	0.87	0.94	7.54	5.65
30-35	15.12	7.45	0.53	0.53	4.77	4.79
35-40	12.08	4.84	2.01	1.61	2.68	3.23
40<	13.42	5.00	0.00	1.25	6.04	2.50
Total	16.38	13.17	0.89	0.94	7.80	5.79

Source: Primary data

Fridge helps to preserve perishable items and food for some time. The milk, vegetables, curd, ice-creams are preserved for some time. Such items are consumed every day in diet. Regular consumption of food in diet helps to improve the nutritional status of family members. But poverty, education, nature of house may effects on the purchase of refrigerator. We have not found the refrigerator with severely malnourished male and female. There are only 0.87 per cent female and 1.16 per cent male are in normal BMI and they have refrigerator in house. The 0.53 per cent female and 0.53 per cent male have refrigerator and they are in obese-II category. Most of the poor do not have telephone connection in house. Telecom authority does not provide the telecom connection to poor households of slums. Their houses are not authorised. Similarly they cannot afford to pay telephone bills. Therefore ownership of television effects on the health status of poor. Telephone in house is useful to call in emergency. Mothers can get appointment of doctors.

Health related guidance can be received from doctor and nurse. Therefore telephone in house is important for health and relations. But we found that the 4.21 per cent female and 5.30 per cent male have telephone of house and they are suffered from severe malnutrition. The 16.67 per cent female and 1.39 per cent female have telephone in house but they are moderately malnourished. The 8.02 per cent female and 6.20 per cent male have telephone in house but they have normal BMI. The 4.77 per cent female and 4.97 per cent male have telephone connection but they are in obese-II category.

m) *The mobility related assets and malnutrition among adults*

The mobility related assets are important to get number of things from community and health care facilities. The time of family members can be saved with the help of mobility assets.

Table 14 : Mobility related assets and malnutrition incidence (Per cent)

BMI/Assets	Bike		Car		Bicycle	
	F	M	F	M	F	M
>15	0.00	4.55	0.00	0.00	1.05	6.82
15-16	3.85	2.78	0.00	0.00	2.56	4.17
16-18.5	0.87	1.32	0.29	0.00	2.02	2.11
18.5-25	01.87	2.67	1.20	0.06	3.61	7.58
25-30	0.37	0.00	0.00	0.00	1.24	0.75
30-35	0.27	0.53	0.00	0.00	1.86	0.53
35-40	0.00	0.00	0.67	0.00	2.68	0.00
40<	0.67	0.00	0.00	0.00	0.00	0.00
Total	0.69	0.81	0.14	0.03	1.57	1.65

Source: Primary data

The bicycle, bike and car helps to ride in city, go to market, buy fresh vegetables from market, take appointment of doctors etc. The poor have irregular

income therefore they cannot afford to pay for bike. The 3.85 per cent female and 2.78 per cent male have bike but they are moderately malnourished. We have not

found the male and female as obese III and bike at home. Car is very expensive for poor households. They do not have space to park vehicles. The car is very useful for traveling but it is not owned by many households in slums. Only 0.20 per cent female and 0.06 per cent male have car and they have normal BMI. It is useful to ride within suburb and slums. It helps to go to market, carry vegetables, milk and others. But poor households do not have money to buy bicycles. The 2.56 per cent female and 4.17 per cent male are moderately malnourished but they have bicycles at home. Only 1.61 per cent female and 1.58 per cent male have bicycle and they are in normal BMI category. We have not found the male and female in obese-IV category malnutrition and bicycle at home.

n) *Logit regression model*

The nutritional status of a child is not a continuous variable, children are either malnourished or are not malnourished. The categories are discrete; consequently we decided to use a logit model. This is also because we are testing only for the categories as

malnourished versus not malnourished. The logit model is given as follows (Greene 2003)

$$\text{Prob (a given child is malnourished)} = \frac{\exp (b'x)}{(1+\exp (b'x))}$$

Where:

X is the vector of explanatory variables; b is the vector of associated coefficients. The regression model is used for stunting, wasting and underweight separately.

o) *Regression results of malnutrition among adults*

We have categorised adults malnutrition based on their weight for height. The BMI indicator is used for adult malnutrition. The malnourished adults are regressed on socio-economic and demographic factors.

$$Y_i = \beta + \beta_1 S + \beta_2 A + \beta_3 I + \beta_4 E + \beta_5 TW + \beta_6 PW + \beta_7 PE + \beta_8 C + \beta_9 BI + \beta_{10} TEL + \beta_{11} BO + \beta_{12} RW + \beta_{13} C + \beta_{14} BE + \alpha$$

The results are presented in the following table.

Table 15 : Regression results of malnutrition among adults

Variables	Co-efficient	Standard error	Z test	Significant
Sex	0.16*	0.053	3.11	0.002
Age	-0.02*	0.002	-6.63	0.000
Income	-0.13*	0.005	-26.33	0.000
Education	-0.01**	0.006	-2.36	0.018
Trip of women	0.02***	0.013	1.86	0.062
Purification of water	0.47***	0.290	1.64	0.100
Private electricity	0.18**	0.083	2.17	0.030
Cooker	-0.18**	0.072	-2.53	0.011
Bike	0.58**	0.265	2.20	0.028
Television	0.20**	0.084	2.47	0.013
Boys preference	0.22**	0.093	2.38	0.017
Read magazine	-0.29***	0.150	-1.96	0.050
Curd	-0.24**	0.123	-2.03	0.043
Beans	0.34**	0.122	2.83	0.005
constant	-3.12*	0.17	-18.07	0.00
	LR chi ² = 1123.17	Prob> chi ² = 0.00	Log likelihood = -4177.28	Pseudo R2 = 0.118

* Significant at 1 %, ** Significant at 5 %. *** Significant at 10 %

The female are more malnourished as compare to male. It is because women are denied the access of food and health care in poor households. They get the lower quantity of food share. They are denied the health care facility when they required. Therefore they are more malnourished as compare to male. Male enjoy the dominant share of food, income, health care in house. Therefore sex of the adult is positively co-related and

statistically significant with malnutrition. The incidence of malnutrition is higher at lower age. The youth's body is in growing stage. It required additional nutrition. But poverty does not help to eat good food and nutrition. At older age, body does not require much vitamins and protein. This is because growth gets completed and body does not required extra nutrition. Therefore age of adult is negatively co-related with malnutrition. The

households in the slums are poor and they have irregular source of income. The irregular work and frequent payments are affecting on the spending of households. Lower income does not help households to buy the necessary inputs required for health. Ultimately it effects on the nutritional status of adults. Therefore the income of household is negatively co-related with BMI and it is statistically significant. Educational achievements are negatively co-related with malnutrition. Highly educated person can understand health status and can find quick solution for health problem. But less educated person does not understand actual health problem. He/She can talk with doctor, nurse and buy medicines. Therefore it is statistically significant and negatively co-related with BMI. The water is not available in most of the poor houses in slums. The stand posts are located far away. The women have no choice but to carry drinking water from long distance. The women wake up early and start carrying water. It is statistically significant and positively co-related with adult malnutrition. The households in the slums do not have fixed source of water. They carry water from different sources. They do not have water purification system at home. They drink water which they brought from different sources. The untreated water effects on the nutritional status of adults. They fall sick because of water washed and water borne diseases. Therefore the purify water is negatively co-related and statistically significant with BMI. Most of the households in the slums do not have proper electricity connection. For the kutcha house, the state electricity board does not provide electricity connection. Most of the poor households took connection from private and illegal sources. They pay much higher electricity charge for the private connection. Therefore it is statistically significant and positively co-related. Most of the poor households do not have separate kitchen. It is because households have kucha and small house. There is no separate room as kitchen. Therefore it is positively co-related and statistically significant with BMI. Most of the households are poor. They do not have proper kitchen wear. The cooker is very useful to prepare food in short period. But the poverty does not help them to buy cooker. Therefore it is negatively co-related and statistically significant. The ownership of bike is negatively co-related and statistically significant with BMI. The bike is very useful to go to market bring vegetables, milk from market, go to workplace and visit relatives. But the households are poor and they cannot buy bike. They cannot park bike near house because there is no space to park the bike. Most of the houses have television in house. Television is house helps to watch different programs. But having television at home does not help adults to reduce the incidence of malnutrition. Therefore having a television at home, there is positive co-relation with malnutrition. Such relationship is statistically significant and positively co-related. The malnutrition incidence among adults is

negatively co-related with reading magazine and it is statistically significant. The poor do not have money to buy magazines. Reading magazines also required time, the poor people of slums do not have time. Therefore it is ultimately effects on their nutritional status. Health related magazines certainly help to improve nutritional status. But not reading magazines are statistically significant and positively co-related with malnutrition among adults. Most of the adults do not eat curd. Curd is a good source of calories and vitamin A. But the households are poor and they cannot afford to bring milk and prepare curd. Buying curd from market is very expensive. Therefore eating curd is negatively co-related and statistically significant. Most of the poor households eat beans. It is a good source of vitamin. But we have not observed how frequently households buy the beans and eat it. But the relationship of beans is positive and statistically significant with adult malnutrition

p) Policy implication

There is need of long and short term comprehensive policies to tackle malnutrition among adults of slums in Mumbai Metropolitan Region. The public investments in health services, water and sanitation infrastructure, and education are required on urgent basis in region. The poor households cannot afford a balanced, micro-nutrient rich diet, better education, shelter, and health care (Svedberg, Peter 2006). Health care staff must visit to slums in region. An iron folic acid tablets, injections and counselling must be provided to pregnant women. They must be encouraged for institutional deliveries and newly mothers must provide exclusive breastfeeding to children. Health care staff must provide health care on priority basis to children who have fever, cough and diarrhoea. Health care staff must monitor growth of the children of various slums in region. They must provide suggestions on modern contraceptives such as condoms, pills, IUD to couples. The modern contraceptive method, contraceptive method related counselling, suggestions on problems of contraceptive method must be provided to couple of slums at free of cost. Such steps will reduce the sterilisation rate among women and it will provide spacing among children. It will also help to reduce fertility among couples and improve the quality of children in slums of region. In short, an existing public and private health care systems need to be strengthened to provide effective health care for adults and children (Aguayo, Victor M. et.al 2012).

Government can start number of programs for the poor people of slums. The specific skills, training and self-employment to women and children can improve their income. Government should encourage commercial banks to provide loans to poor people at lower interest rate. It will help them to start their own small scale business. Government must ensure and force private sector to provide maternity leave to

pregnant women those are working in informal sector. Government must establish day care centres at different slums. The malnourished children must be feed properly in day care centres. The day care centres must be connected to anganwadi's and health care centres in region. The comprehensive coverage of anganwadi and health care facilities are required on urgent basis. Government must establish infrastructure facilities in slums of metropolitan region. The water supply, sanitation, electricity, roads, transportation must be provided in slums. Government must prepare short stories and episodes of maternal and child health related programs and they must be broadcast on television and radio. Most of the women and household members will listen such programs while working. Such efforts will help to reduce the incidence of malnutrition among adults. Government must provide rice, wheat, sugar, oil through public distribution system to poor people of various slums. It will help to improve calorie intakes and nutritional status of people. For slums, NGO's, researchers, social workers and politicians must suggest various policies related education, health care, income, skills, employment, water and power supply, roads and transport. Such steps will help to reduce malnutrition incidence among adults and children.

Government is required to work for poor adolescent girls of different slums in suburbs. They must be provided scholarship for education. The age at marriage of adolescent girls must be increased through enhancing education and government must make strict law related to underage or illegal marriages. The educated girls must be given preference in government jobs. If the economic status of such girls is improving then child malnutrition incidence will decline automatically. Government must regulate and legalise houses of the poor people in region. Demolition of houses is not the solution to eradicate poverty and malnutrition among adults.

There should be political commitment to improve nutritional status of adults of slums in region. Local leaders must come forward to implement various policies for poor people. There is need of active involvement of households, leaders, social workers in various programs for poor people of slums. For economic development of any region and country, qualitative human resource is required. Therefore every child and adult must be seen as window of opportunity for future human resource of region. All the policies will certainly reduce the incidence of malnutrition among adults in region at some extent.

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