POVERTY AND UNDER NUTRITION AMONG UNDER FIVE AGE GROUP CHILDREN IN MUMBAI METROPOLITAN REGION

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Abstract
Child malnutrition is a major health problem in India. Mumbai Metropolitan Region is an economically most developed region of Maharashtra. High economics growth of region should not have high incidence of malnutrition among below five age group children. But we found that there is high incidence of underweight among below five age group children in Govandi, Thane, Bhandup. The incidence of stunting is found more in Ghatkopar, Thane, Turbhe, Mulund and Bhandup. The wasting incidence among below five age group children is found more in Koparkhirne, Turbhe, Mulund and Bhandup. At below one age group, more children are underweight, stunted and wasted. Lower household size, parents lower education, lower income and lower asset holding leads to malnutrition among children. We estimated around one lakh deaths per annum of under-five age group children in Mumbai Metropolitan Region. We have used logit regression model to examine the co-relation of child malnutrition with socio-economic and demographic factors. The incidence of underweight is negatively co-related to age, per capita income, time required to carry water, television, pulses, other methods of contraceptives, injections. It is positively co-related to telephone and curd. The stunting among children is negatively co-related to age, time required, television, bike, pulses, other methods of contraceptives, injections, age at marriage and sterilisation. It is positively co-related to sex, bed, curd, and home delivery. The incidence of wasting is negatively co-related to age, television, pulses and injections. It is positively co-related to per capita income and curd. There is need of different policies in different slums of region. Health care staff must visit slums regularly. They must treat all patients, counsel on immunisation, breastfeeding and institutional deliveries. Government must start training and self-employment for poor people of slums. The NGO'S, researchers, social workers, politicians must work together for the higher standard of living of population. Government must invest money infrastructure in facilities for poor of slums. Slums should not be demolished in region. They are integrated part of region. Every child must be seen as window of opportunity for future human resource of region. Such policies will certainly reduce malnutrition among children at some extent in Mumbai Metropolitan Region.
Keywords: Health, Nutrition, Immunisation

1. INTRODUCTION

Under-nutrition remains the most important nutritional problem in developing countries. At an early age, it affects the growth and development of children, especially in conditions of poverty.

The under nutrition is associated with retarded brain growth and functional development that persists into adult life. However, these inter-relationships do not have a direct cause–effect relationship since complex interactions are established during the lifetime of the individuals (Ivanovic, Daniza M. et.al 2002).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.

2. URBAN POOR IN MUMBAI METROPOLITAN REGION

The urban poor in Mumbai Metropolitan Region of the slums place greater reliance on wage labor 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 labor. For women labor pregnancies are not unusual. Pregnant women are required to register with a public health facility in order to get antenatal care. Ante and post natal care comprises as tetanus toxoid immunisation, micronutrient supplementation (including iron and folic acid tablets for pregnant women and possibly a postpartum Vitamin A mega –dose) iodised salt consumption,

food supplementation during pregnancy, malaria chemoprophylaxis in endemic areas and reproductive health education including the importance of delaying conception until after adolescence and of ensuring safe birth intervals. But due to the overcrowded public health facilities and the informal sector job market, pregnant women involved in daily wage earning are still expected to continue their daily income generating activities and contribute to household income. Most of the pregnant women have few pre-natal visits. They do not get maternity leave in informal sector jobs. The newly mothers have to return to work immediately after their delivery. These mothers do not generally have the economic flexibility to prolong their unpaid maternity leave. Economic constraints among mothers make them feel that they do not have any choice other than to pursue their activities in order to retain their household livelihood and food security. This constrains the mother's ability to provide the requisite amount of child care and breastfeeding. The breastfeeding protects the baby against infections, allergies and asthma. It promotes physical, physiological, motor, mental and psycho-social development and gives protection against obesity and some adult diseases such as diabetes, hypertension, ischemic heart disease and some forms of malignancy. An adequate breastfeeding saves money for the family and helps fertility control. Breastfeeding has also been related to possible enhancement of cognitive development. There are advantages of breastfeeding to mothers. The breastfeeding reduces the incidence of post-partum bleeding, leads to faster uterine involution, reduces the risk of breast cancer and ovarian cancer, delays resumption of ovulation and increases child spacing, improves bone re-mineralisation after birth in women with reduction in hip fractures in post-menopausal period. Some studies have indeed found a negative relationship between working status of mothers and child's nutritional status (Radhakrishna and Ravi 2002). The presence of her young children imposes a constraint on the mothers because they require breastfeeding and care at all times. Most of the mothers are transfer their responsibility of supervising, food and care on to older siblings, relatives or neighbours. Young children are fed insufficient number of times per day and get an inadequate diet. Finding reliable and affordable childcare is a challenge for mothers who reside in slums across Mumbai Metropolitan Region. The study found that the continue neglect of child health and child care services are affecting on malnutrition (Kumar A. and K. Shiva 2007). The mothers involved in highly labour intensive jobs do not get sufficient time to recuperate after delivery. This further stresses the mother's nutritional status and reduces her bodily reserves. These reductions in body energy affect the lactation performance of the mothers. Therefore mothers cannot breastfeed their children for a longer period of time. Infections are rampant among children because of lack of access to clean water, sanitation, hygiene, health care etc.

Public health care facilities in the urban area are heavily demanded, which results in longer waiting periods. Therefore facilities like pre-post natal care, immunization, family planning, control of

communicable diseases and curative medical care have a lower coverage. As far as children's treatment is concerned, mothers have to go early in the morning, wait in long queues to meet a doctor. 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 labor 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 labor market do not have time to prepare daily necessary meals, which are required for the family. Therefore the children of urban slums grow up without hygiene, medical care, exclusive breast-feeding or a balanced diet.

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 kutcha 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, 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. Young children become more vulnerable to water related diseases as a result of weak body defences, higher susceptibility and greater exposure from an inadequate knowledge of how to avoid risks. The kutcha 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 Integrated Child Development Services (ICDS) program is well focused and functioning in Mumbai Metropolitan Region but it has a lower coverage of supplementary feeding, and immunization against childhood diseases, health check-ups, referral health and nutrition education to adult women or preschool children of 3-6 years. In urban kutcha slums, the density of population is very high. Therefore the total number of children below five years, pregnant women and lactating mothers are also very high. A single overburdened anganwadi worker could not be able to provide supplementary feeding as well as home visits for the younger children. This is because of time constraints and also because of perceived knowledge limitations regarding health and nutrition. Most of the katcha slums in region are neglected and without supplementary feeding. 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 kutcha slums by bulldozing them is a regular phenomenon in Mumbai Metropolitan Region. The poor of the urban kutcha 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.

Data and methodology:

For this study, we have surveyed 3004 households from kutcha 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.

Definition of malnutrition:

Malnutrition refers to "Impaired capacities of human body because of nutrient and health related inputs. The essential nutrients required by the human body from food are: Carbohydrates, proteins, fat, vitamins and minerals. The last two are classified as minor nutrients and are required in small quantities. The main concern all along has been with protein – calorie malnutrition" (Mehta J.1982).

"Malnutrition is the combined result of inadequate dietary intake and disease. It may also result from a combination of causes, such as the lack or low utilization of health services and professionals who are poorly trained and motivated, inadequate water supplies and sanitary facilities, poor food hygiene and inadequate child care (Rokx C., Galloway R., and Brown L. 2002).

Malnutrition is a multidimensional phenomenon. In broad terms, it may be divided into protein energy malnutrition and micronutrient deficiency. The former manifests itself most prominently in poor gains in height, weight, and circumferences of head and mid-upper arm. Other physical symptoms such as skin peeling, abdominal distension, liver enlargement, and sparse hair as well as behavioural characteristics such as anxiety, irritation, and attention deficit may also accompany protein deficiency. Micronutrient deficiency results from inadequate levels of iron, folate, iodine, and various vitamins, including A, B6, D, and E, in the body. These deficiencies lead to anaemia, goitre, bone deformities, and night blindness (Panagariya, Arvind 2013). We found numbers of definitions of malnutrition by different authors in literature.

The Z score:

All three measures are commonly expressed in the form of Z score (Horold A. 2000, Kostermans K. 1994, Galloway R. 1991, Giliespie S. and Lawrence H. 2003), which compares a child's weight and height with the weight and height of a similar age, sex, child from a reference healthy population. More precisely weight and height of children of a certain age group follow more or less the normal distribution. The stunting Z score of a child i^{th} is the difference between the height of that child Hi and the median height of a group of healthy children of the same age and sex from the reference population Hr divided by the standard deviation of the height of those same group of children (same age and sex) from the reference population SDr. The value of the Z score can be conceived as the number of standard deviations that the child is away from the median of the concerned indicator of the children of that age/sex group from the standard population.

Mathematically,

$$Z \text{ score} = \frac{\text{Child's Anthropometric Value} - \text{Median of Reference Population}}{\text{Standard Deviation of Reference Population.}}$$

The basic idea is to assume that the given child comes from a healthy population. Under this null hypothesis, the Z score should follow the standard normal distribution. If the value of the Z score is sufficiently low that it has a very small probability of occurring, we reject the null hypothesis and classify the child as malnourished. Relatively short children have negative height for age, Z score and thus moderately stunted children are classified as those that have Z score –2 and severely stunted children are classified as those that have Z score –3.

The Z score for low weight for age ("underweight") is calculated in the same way using the weight of the child (instead of height) and the median weight (and standard deviation) of the children of the same age and sex from a healthy reference population. Finally Z score for "wasting" (Low weight for Height) is obtained by comparing the weight of the child with the median weight (and standard deviation) of children from the reference population who have the same height as this child. The International Reference Population advocated by the US, Centers for Disease Control (CDC) is based on data from the National Center for Health Statistics (NCHS). The two preferred anthropometric indices for the measurement of nutritional status of children are stunted and wasted, since they distinguish within long run and short run of physiological processes. The "wasting" (Low weight for height) index has the advantage that it can be calculated without knowing the child's age. It is particularly useful in describing the current health status,

of a population and in evaluating the benefits of intervention programs, since it responds more quickly to changes in nutritional status than does stunting. "Stunting" measures in the long run reflects social condition, because it is reflecting past nutritional status. Thus the WHO recommends it as a reliable measure of overall social deprivation (Glewwe P., Koch S., and Nguyen 2002) and it is proxy for multifaceted deprivation. By consequences, being wasted is a better indicator for the determination of short-term survival, whereas sensitivity and specificity of survival in a one or two year period is highest for weight for age (Kostermans K. 1994). The weight for age indicator is intended to capture both long term (stunting) and short term (wasting) under nutrition. It has been the indicator used most frequently by WHO, UNICEF and other international organizations concerned with the health status of children.

India continues to have a high burden of child under nutrition – driven by a range of persistent and pervasive determinants that play out and interact at different levels. In keeping track of the nutritional status of India's young children, WHO-recommended child growth standards are entirely applicable, as they are to young children from any other country (Gillespie, Stuart 2013). Therefore we have used WHO recommended child growth standards in this study.

Econometric model for malnutrition among children:

The numbers of socio-economic and political factors are different for different children.

$$Nsc = (s,\ e,\ d)$$

The nutritional status of children is related to socio-economic and demographic factors

Alternatively,

$$Nsc = (A, Hs, Pe, Am, PCI, A, Kn, F, C, Pnc, Ci)$$

Nutritional status of child related to age, household size, parents education, age at marriage of parents, PCI, physical, electronic and mobility related assets, nutritional knowledge, vegetarian and non-vegetarian food, contraceptives, pre and post natal care and child illness. We have further categorised the above factors in more detail.

$$Pe = (I,\ P,\ S,\ HS,\ C)$$

Parent's education consists of primary, secondary, high school and college.

$$A = (P, E, Mo)$$

The assets in house are classified as physical assets, electronic and mobility related assets. Such assets are further classified as follows,

$$P = (C, B,\ Sw)$$

Physical assets in house consist of chairs, bed and tables and sewing machine at home.

$$E = (Fa, Sm, R, T, W, F, Te)$$

The electronic assets consist of fan, radio, television, watch, fridge, telephone.

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

Mobility related assets consist of bicycle, bike and car in house.

$$Nk = (M, N, T, C)$$

The nutritional knowledge is received from magazines, newspapers, television, and watching cinema.

$$F = (V, Nv)$$

Food consists of vegetarian and non-vegetarian food

$$Ve = (Gv, P, F, Mi)$$

Vegetarian food consists of green vegetables, pulses, fruits and milk and related items.

$$NV = (Eg, Me, Chi, Fi)$$

Non vegetarian food comprises of eggs, meat, chicken and fish.

$$C = (M, T, Nk)$$

Contraceptives are mainly classified as modern, traditional and not known methods.

$$M = (P, C, Is, V)$$

Modern contraceptive methods consist of pills, condoms, IUD, sterilisation and vasectomy.

$$T = (P, A, O)$$

Traditional method of contraceptives consists of periodic absentee, other methods.

$$Anc = (T, I, V)$$

Antenatal care consists of iron folic acid tablets, injections and at least three visits to health care facility.

$$Id = f(Ad, An, D)$$

The institutional deliveries are classified as deliveries attended by doctor, nurse and dai.

$$Hd = f(Ad, An, N, D)$$

Home deliveries are attended by doctor, nurse and midwife and dai at home or they are not attended at all.

$$CNSc = (B, Sf, A)$$

The current nutritional status of children is explained as the children provided breastfeeding, supplementary and anganwadi feeding.

$$IC = (C, F, D)$$

Illness to children are categorised as they have cough, fever and diarrhoea.

$$Mt = (PV, Pu)$$

Medical treatment provided to children from private and public sector for different illness.

Incidence of underweight among pre-school children:

The preschool children are classified as underweight if the weight for age falls below two standard deviation of reference population. Based on this criterion, we have classified the underweight children according to suburbs of Mumbai Metropolitan Region

TABLE 1 - INCIDENCE OF UNDERWEIGHT AND STUNTING (PER cent)

Suburb	Underweight		Stunted	
	Female	**Male**	**Female**	**Male**
Mankhurd	26.51	13.16	24.10	18.42
Govandi	100.00	99.08	33.33	20.18
Kalwa	8.74	3.20	12.62	5.60
Koparkhairne	0.00	0.00	33.33	8.33
Rabale	16.67	0.00	25.00	0.00
Turbe	12.50	23.81	46.88	42.86
Vashi	21.05	18.60	44.74	48.84
Ghatkopar	29.17	33.33	66.67	40.74
Reay road	15.79	20.00	42.11	43.33
Kurla	18.99	21.52	48.10	50.63
Chunabhatti	18.75	33.33	50.00	88.89
Byculla	0.00	33.33	0.00	33.33
Thane	82.09	68.97	67.16	72.41
Airoli	27.27	42.86	45.45	42.86
Juinagar	37.50	0.00	37.50	38.46
Chembur	7.69	7.14	23.08	28.57
Mulund	40.00	46.15	63.33	65.38
Bhandup	55.81	65.85	86.05	87.80
Total	38.49	35.24	41.14	35.92

Source: Primary data

All the male and female are underweight in Govandi. There is no adequate access to water supply, health care, sanitation in slum. Households do not have regular source of income. The per capita income is low. The incidence of underweight is not found among female in Byculla. There are few government hospitals are located in this area. Health care is easily available to poor people. Therefore incidence of underweight is low. Among male, underweight is not found in Juinagar and Byculla. Sex appears as a valuable target defining variable because girls are much more likely to be underweight than boys (Jakobsen O. 1978). The incidence of stunting among female is found as 86.05 percent in Bhandup. It is 88.89 per cent among female. The slum household do not find the health care facilities. The children are not taken to health care facilities due to poverty. The incidence of stunting among female is not found in Byculla. The lowest incidence of stunting among female is found in Kalwa (5.60 percent). Stunting (i.e. low height-for-age) is a chronic condition that reflects poor linear growth accumulated during pre and/ or postnatal periods because of poor nutrition and/or health. It is more difficult to treat than acute forms of under-nutrition such as wasting (Taguri, Adel El. et.al 2008)

TABLE 2 INCIDENCE OF WASTING (PER CENT)

Suburb	Wasted	
	Female	Male
Mankhurd	3.61	3.95
Govandi	2.94	2.75
Kalwa	8.74	4.80
Koparkhairne	25.00	8.33
Rabale	8.33	0.00
Turbe	12.50	11.90
Vashi	5.26	4.65
Ghatkopar	0.00	0.00
Reay road	5.26	0.00
Kurla	3.80	7.59
Chunabhatti	0.00	11.11
Byculla	0.00	33.33
Thane	7.46	8.62
Airoli	0.00	0.00
Juinagar	6.25	0.00
Chembur	0.00	7.14
Mulund	20.00	15.38
Bhandup	6.98	19.51
Total	6.56	6.39

Source: Primary data

The high incidence of wasting among female is found (25 per cent) in Koparkhirne. The households are poor and they do not get minimum income to buy different food grains and vegetables. Therefore low availability of food in house is affecting on the health status of children. The high incidence of wasting

among male is (33 percent) found in Byculla. The incidence of wasting among female is not found in Ghatkopar, Chunabhatti, Airoli and Chembur. The households are found at better economic status. They find employment in nearest area. Therefore food is purchased and provided to all household members. Among male, the incidence of wasting is not found among female in Rabale, Ghatkopar, Reay Road, Juinagar and Airoli. We have not found wasting incidence among male and female in Ghatkopar and Airoli. Such areas are economically better off. Therefore people are not very poor and they have employment and household assets. Therefore incidence of wasting among children is low. The study found that age group, mother's religion and younger siblings as significantly associated with wasting (Beiersmann, Claudia et.al 2013).

Simultaneous incidence of malnutrition among children:

Simultaneous incidence of malnutrition is classified as child falls below 2 standard deviation of reference population for Weight for Age (W/A), Height for Age (H/A) and Weight for Height (W/H).

TABLE 3 - SIMULTANEOUS INCIDENCE OF MALNUTRITION (PER CENT)

	Male	Female	Total
Simultaneous incidence of stunting, wasting and underweight	4.35	4.04	4.20

Source: Primary data

The simultaneous incidence of stunting, wasting and underweight among children is 4.20 percent in Mumbai Metropolitan Region. Among male, simultaneous incidence of malnutrition is slightly (4.35 per cent) higher as compare to female (4.04 percent). Genetically girls are stronger than boys. Therefore they are less likely to be malnourished. The gender bias in food may not get reflected in malnutrition among females. Age is an important determinant of malnutrition among children. At lower age, immunity system does not get well developed and therefore infections lead to deterioration of health status. In slums, environment is not healthy for the growth of the children. The soil, air, water pollution is affecting on health status of small children. At higher age, children's digestion and immune system improves.

TABLE 4 - INCIDENCE OF MALNUTRITION ACCORDING TO AGE (PER CENT)

Age of child (Years)	Underweight		Stunted		Wasted	
	Female	Male	Female	Male	Female	Male
00-01	56.25	52.07	67.97	54.55	25.00	23.14
01-02	49.14	38.16	43.10	38.82	7.76	6.58
02-03	32.05	29.05	35.90	35.14	2.56	4.05
03-04	29.05	35.66	33.78	30.23	1.35	0.78
04-05	31.95	26.63	30.77	26.09	0.00	1.09
Total	38.49	35.29	41.14	35.97	6.56	6.40

Source: Primary data

The high incidence of underweight among female (56.25 per cent) and male (52.07 per cent) is found in 0-1 age group children. The lowest incidence of underweight among female is found as 29.05 per cent in 3-4 age group children. Among male, it is observed as 26.63 per cent in 4-5 age group. The high incidence of stunting among female is observed as 67.97 per cent in 0-1 age group. Among male, the highest incidence of stunting is observed in 0-1 age group. The highest incidence of stunting among male is observed in 0-1 age group (54.55 per cent). Male children are not genetically strong and therefore there is chance that they will be more malnourished at lower age. The lowest incidence of stunting among female is observed as 30.77 per cent in 4-5 age group. Among male, the lowest stunting is observed (26.09 per cent) in 4-5 age group. The highest incidence of wasting is observed (25 per cent) among female and (23.14 per cent) male in 0-1 age group. The incidence of wasting among female is not found in 4-5 age group. Among male, the lowest (0.78 per cent) incidence of wasting is found in 3-4 age group.

Socio-economic determinants of malnutrition among children:

Household size is important determinant of child malnutrition. Small household size is affecting on care of children. At the same time, in the large household size, there is competition for nutrition and health care. Small children get the least priority in large households.

TABLE 5 - INCIDENCE OF MALNUTRITION AND HOUSEHOLD SIZE (PER CENT)

Household size (No.)	Underweight		Stunted		Wasted	
	Female	Male	Female	Male	Female	Male
1-3	43.33	35.29	52.50	41.18	11.67	9.24
3-6	35.70	34.23	38.28	36.52	5.59	6.31
6-9	42.52	40.24	42.52	25.61	5.51	2.44
9-12	80.00	45.45	10.00	27.27	10.00	9.09
Total	38.49	35.24	41.14	35.92	6.56	6.39

Source: Primary data

The highest incidence of underweight among female (80 per cent) and male (45.45 per cent) is found with 9-12 household members. The lowest incidence of underweight is found among female (35.70 per cent) and male (34.23 per cent) in 3-6 household size. The high incidence of stunting among male (52.50 per cent) and female (41.18 per cent) is found within 1-3 household size. The lowest incidence of stunting among female is found (10 per cent) in 9-12 household size. Among male it is 25.61 per cent with household size as 6-9 members. Among male, it is 25.61 per cent in 6-9 household size. The highest incidence of wasting among female (11.67 per cent) and male is (9.24 per cent) found with 1-3 household size. The lowest incidence of wasting among children is found with 6-9 household size. It is 5.51 per cent for female and 2.44 per cent for male.

Parent's education and nutritional status of children:

The parent's education is primary determinant of nutritional status of children. The father's education is positively related to child's health. The highly educated fathers always give high priority to child health care and nutrition. An educated father understands the physical growth and its importance for future physical capacity and strength.

TABLE 6 - INCIDENCE OF MALNUTRITION AND FATHERS EDUCATION (PER CENT)

Father's education	Underweight		Stunting		Wasting	
	Female	Male	Female	Male	Female	Male
Illiterate	38.99	36.59	41.77	38.18	7.09	7.05
Primary	48.48	39.06	48.48	37.50	13.64	9.38
Secondary	35.40	32.23	38.50	28.91	3.98	4.74
High school	37.04	31.25	37.04	50.00	3.70	0.00
College	0.00	0.00	33.33	15.00	0.00	0.00
Total	38.49	35.24	41.14	35.92	6.56	6.39

Source: Primary data

The father's education plays an important role in generating higher income. Fathers can provide good health care to children. Nearly 48.48 per cent female and 39.06 per cent male are underweight with primary education of father. We have not found the incidence of underweight among below five age group children with father's college education. The incidence of stunting among female (48.48 per cent) is higher with father's primary education. Among female, the incidence of stunting is 50 per cent with father's high school education. The incidence of high wasting is observed among female (13.64 per cent) and male (9.38 per cent) with father's primary education. Incidence of wasting among children is not found with father's college education.

Mother's education is directly related to child health. Highly educated mothers use community related resources, health care and nutrition. They develop many contacts in community and takes regular appointment of doctors for self and child health. Educated mothers are too much concerned about the child health and nutrition. First, formal education may directly transfer health knowledge to future mothers; second, the literacy and numeracy skills acquired in school may enhance the capability to diagnose and treat child health problems; third, increased familiarity with modern society through schooling may make women more receptive to modern medicine. These are not mutually exclusive and are additional to the impact of schooling on household income (Christiaensen, Luc and Harold Alderman 2004). Maternal education is continued to be very strong predictors of children's nutritional outcomes (Waters, Hugh et.al. 2004)

TABLE 7 - MOTHER'S EDUCATION AND MALNUTRITION INCIDENCE AMONG CHILDREN (PER CENT)

Mother's education (Years)	Underweight		Stunted		Wasted	
	Female	Male	Female	Male	Female	Male
Illiterate	38.33	36.55	40.24	36.10	6.90	6.73
Primary	52.24	43.24	58.21	41.89	11.94	9.46
Secondary	36.49	30.81	37.91	33.33	4.74	5.05
High school	11.76	15.38	29.41	38.46	0.00	0.00
College	50.00	25.00	100.00	25.00	0.00	0.00
Total	38.49	35.24	41.14	35.92	6.56	6.39

Source: Primary data

Mother's education is determinant of child health status. But less educated mothers do not provide good health care, nutrition to children. She can't use effectively the community related resources. The incidence of underweight among female (52.24 per cent) and male (43.24 per cent) is high with mother's primary education. The lowest incidence of underweight is found among female (11.76 per cent) and male (15.38 per cent) with high school education of mothers. The high incidence of stunting among female (58.21 per cent) and male (41.89 per cent) is found with mother's primary education. The lowest incidence of stunting is found among female (15.00 per cent) and male (25.00 per cent) with mother's college education. The incidence of wasting with mother's primary education among female (11.94 per cent) and male (9.46 per cent) is high. The incidence of wasting with mother's college education is not found among male and female in slums of Mumbai Metropolitan Region. The study has found that mother's education (at least primary) has a positive and significant effect on children's nutritional status, but father's education is not significant. It has recently been investigated that how mother's education influences the child health (weight- for-age and/or height-for-age). The mother's education helps to understand how to manage nutrition and disease most effectively, and increases the knowledge of appropriate sanitary behaviour. Education also influences other socio- economic characteristics like the age at which women marry, the number of children they have, and their status within the community. A correlation of education with unobserved household heterogeneity such as taste, knowledge of symptoms of illness and health, and food preparation methods have also been discussed in the literature. Finally, education allows women to process information from media (television) more efficiently and to identify better quality health care (Arif, G. M. 2004). At lower age, women's physical growth does not take place. Pregnancy at early age put unnecessary stress on bodily reserves. At older age, women's body easily adopt pregnancy and the stress. She becomes capable to provide breastfeeding and other care to children.

TABLE 8 - AGE AT MARRIAGE AND INCIDENCE OF MALNUTRITION AMONG CHILDREN (PER CENT)

Age at marriage(years)	Underweight		Stunted		Wasted	
	Female	Male	Female	Male	Female	Male
Below 15	34.71	27.97	37.19	33.57	7.40	4.90
15-20	41.37	38.25	44.02	39.03	3.23	7.38
20-25	24.19	30.99	27.42	19.72	0.00	2.82
25-30	25.00	0.00	25.00	16.67	0.00	0.00
Total	38.59	35.24	41.14	35.92	6.55	6.39

Source: Primary data

The age at marriage is one of the determinants of child malnutrition. The study found that the mothers of the malnourished children are younger with lower education status (Diana Olita'a et.al 2014). At lower age, the mothers have physical and mental stress of work and child health. The incidence of underweight with mother's 15-20 age group is high among female (41.37 percent) and male (38.25 per cent). The lowest incidence of underweight is found among female (25 percent) and it is nil for male with 25-30 age at marriage of mothers. The incidence of stunting among female (44.02 percent) and male (39.03 percent) is higher with mothers 15-20 age at marriage. The incidence of stunting with 25-30 age at marriage is low among female (25 percent) and male (16.67 percent). The incidence of wasting among female is 7.40 percent below 15 age at marriage of mothers. Among male (7.38 percent) high incidence of wasting is observed with 15-20 age at marriage of mothers. We have not found wasting incidence among male and female with 25-30 age at marriage of mothers. Household income is a significant determinant of child health. Low income of family certainly effects on the health status of the child. Low income households cannot buy necessary inputs required for the child health. They cannot buy health care, nutrition and cloths for the children. It effects on the growth and gain weight of children. High income households immediately take appointment of doctor and buy the necessary medicines and nutrition. Greater incomes at the household level mean that families can invest more in food consumption, access to clean water and good hygiene, and effective health care. They can also afford more effective child care arrangements. At the community level, greater income will eventually lead to better access to and better quality of health care centres and water and sanitation systems (Haddad, Lawrence et.al 2000).

TABLE 9 - PER CAPITA INCOME AND CHILD MALNUTRITION (PER CENT)

Per capita income (Rs.)	Underweight		Stunted		Wasted	
	Female	Male	Female	Male	Female	Male
0	100.00	0.00	100.00	0.00	0.00	0.00
0-1000	40.27	34.05	34.07	30.17	4.42	3.88
1000-2000	39.64	37.91	42.01	34.07	7.69	5.77
2000-3000	27.62	31.68	42.86	49.50	6.67	13.86
3000-4000	43.59	29.63	61.54	66.67	7.69	11.11
4000-5000	66.67	20.00	66.67	20.00	0.00	0.00
5000<	40.00	20.00	80.00	20.00	20.00	0.00
Total	38.49	35.24	41.14	35.92	6.56	6.39

Source: Primary data

Almost all female are underweight with zero per capita monthly income of family. For male (37.91 per cent), the high incidence of underweight is found with Rs 1000-2000 per capita income. The lowest incidence of underweight among female (27.62 per cent) and male (31.68 per cent) is found with Rs. 2000-3000 monthly per capita income. All the female are stunted with zero per capita income per month. The 66.67 per cent male with Rs 3000-4000 per capita income are stunted. We have found lowest incidence of stunting among female (34.07 per cent) with zero to thousand rupees per capita per month. Similarly, we have not found incidence of stunting among male with zero per capita income. The incidence of wasting is found as 20 per cent among female with above Rs. 5000 per capita monthly income. The wasting among male and female is not found with zero and Rs.4000-5000 per capita income. The incidence of wasting is found as 13.86 percent with Rs. 2000-3000 per capita income.

Physical assets and malnutrition among children:

Physical assets are important determinant of child malnutrition. Physical asset holding help family members to improve nutritional status.

TABLE 10 - PHYSICAL ASSET HOLDING AND INCIDENCE OF MALNUTRITION AMONG CHILDREN (PER CENT)

Assets	Underweight		Stunted		Wasted	
	Female	Male	Female	Male	Female	Male
Cooker	49.28	49.42	53.56	59.85	42.55	44.68
Bed	15.22	13.90	17.97	18.18	8.51	12.77
Watch	20.29	11.97	20.00	15.15	12.77	12.77
Electricity connection	88.49	86.10	82.71	78.79	76.60	68.09
Fan	89.49	84.17	80.34	76.52	72.34	63.88
Bicycle	2.54	1.16	2.03	1.14	4.26	2.13
Swing machine	0.36	0.00	0.00	0.00	0.00	0.00
Radio	1.45	0.77	1.02	1.14	2.13	0.00
Telephone	29.71	31.27	19.32	18.18	25.53	23.40
Refrigerator	0.72	0.39	0.68	0.76	0.00	0.00
Television	16.30	14.29	12.54	8.33	19.15	21.28
Bike	1.81	0.00	0.34	0.00	0.00	0.00
Car	0.36	0.00	0.00	0.00	0.00	0.00

Source: Primary data

Having cooker at home helps mothers to prepare food in short period. But low income does not help households to buy cooker in house. The incidence of underweight with cooker is 49.28 per cent among female. Among male, it is 49.42 per cent. The incidence of stunting with cooker in house is 53.56 per cent among female and it is 59.58 per cent among male. Bed at home helps to relax family members. But in

slums, there is no space to keep bed due to small size of house. Households do not have money to buy bed. The incidence of stunting is high among female (17.97 per cent) and male (18.18 per cent) with household having bed.

Clock is useful to watch time. But the walls are made up of plastic sheet, therefore most of the houses do not have watch. The incidence of underweight is (20.29 per cent) high among female with households having watch. Among male, the incidence of stunting with watch is observed as 20 per cent. Electricity is not found in most of the households. In kutcha slums, the electric meter is not provided by MSEB. Most of the houses have one point illegal connection. Households cannot use electricity for different purposes. The incidence of underweight among female (89.49 per cent) and male (86.10 per cent) is high with electricity connection in house. Fan is required an electricity connection in house. Most of the houses in slums have only one point and it is used for bulb or tube light. Bicycle is important to go market and carry different things. But households in slum do not have bicycle because, they do not have space to keep bicycle. Households do not have money to buy bicycle. The incidence of wasting among female (4.26 per cent) and male (2.13 per cent) with bicycle in house is lower. Swing machine is useful to stich cloths. But poverty does not support to buy swing machine. At the same time, washing machine at home saves maximum time of women. But households are poor and they cannot buy washing machine. The incidence of stunting and wasting with swing machine is not found among male and female. Radio at home helps to listening songs, family planning programs, experts view on maternal and child health care. The incidence of underweight among female (1.45 per cent) with radio is lower. Telephone connection is not provided to poor households of slums. It is because the households are too poor and do not have money to pay telephone bills and they do not own the house also. Most of the houses are unauthorised in nature. Therefore telephone connection is not provided. Nearly 29.71 per cent female and 31.27 per cent male are underweight but the house has telephone. The incidence of stunting among female (19.32 per cent) and male (18.18 per cent) is higher with household having telephone. Refrigerator in house is useful to preserve food. The fresh food bought from market such as fruits, milk, vegetables. It can be preserved for longer period. It is useful to have continuous access to nutrition. Family easily improve the nutritional status of all members. The incidence of wasting among children is not found with households having refrigerator. Television at home helps to listen and watch various talk shows related to health, nutrition. Number of health related products are advertised on television. Mothers can easily pick up such products which can improve the nutritional status of children. The incidence of wasting among female (19.15 per cent) and male (21.28 per cent) is lower with television in house. Bike at home helps to go to market, visit relatives and use community resources effectively. But most of the households are poor and they do not have money to buy bike. Having car helps family to access number of community resources and travel

long distance. But poor households cannot buy car due to lack of money and space for parking. Incidence of malnutrition among children is almost nil with bike and car in house.

Knowledge of nutrition to parent's and nutritional status of children:

Knowledge of nutrition is very important for healthier growth of adults and children. But most of women of poor households do not have knowledge of nutrition.

TABLE 11 - ACCESS OF NUTRITIONAL KNOWLEDGE TO MOTHERS AND CHILD MALNUTRITION (PER CENT)

Access to knowledge	Underweight		Stunted		Wasted	
	Female	Male	Female	Male	Female	Male
Read magazines	2.54	5.79	2.37	3.03	4.26	6.38
Read newspapers	0.36	0.39	0.00	0.76	0.00	0.00
Watch television	52.9	47.49	55.93	53.03	51.06	53.19
Watch cinema	12.68	13.13	6.78	5.3	10.64	6.38

Source: Primary data

Reading a magazine helps to understand child growth and care of child. But mothers are less educated and they cannot buy magazines in slums. The 2.54 per cent female and 5.79 per cent male are underweight but their mothers are reading magazines. Nearly 4.26 per cent male and 6.38 per cent female are wasted but mothers are reading magazines. Reading everyday newspaper helps the mothers to keep updated information of various social issues, health care problems in city and immunisation. But most of the households are poor and they cannot buy regular newspaper. The 0.36 per cent female and 0.39 per cent male are underweight but their mothers are reading newspaper. The children those are wasted, the mothers are not reading newspaper. Television watching is very important to get news, new research and development and health related products. But households are too poor and cannot buy and watch television every day. Similarly women are engaged in child care, household chores and daily earning activities. They do not find time to watch television. The 55.93 per cent female and 53.03 per cent male are stunted but their mothers are watching television. The 52.9 per cent female and 47.49 per cent male are in this category. But their mothers are watching television. Watching cinema is fun and entertainment for mothers. But they are involved in work and do not find time to watch cinema at least once in a week. The women are watching cinema once in a week but 12.68 per cent female and 13.13 per cent male are underweight.

There are 27.97 per cent female and 25.41 per cent male are underweight but mothers know about nutrition. As far as stunting is concerned then 23.73 per cent female and 21.52 per cent male are stunted but mothers know about the nutrition. The drinking milk helps to improve nutritional status of mother and child. But mothers and children cannot drink milk every day. They cannot afford to buy milk everyday due to lower income. There is no provision to preserve milk for longer period. They buy milk once in a week

and use it for one or two days. There is also cost of preservation of milk. There are 79.66 per cent female and 79.62 per cent male are stunted but mothers drink milk. We have not asked the quantity of milk drunk by mothers. Curd in the diet helps to improve nutritional status of adults and children. But the poor families do not buy more milk so they do not prepare curd at home. They buy curd once or twice in a week. Most of the times, they do not buy the curd also. Nearly 57.29 per cent female and 58.71 per cent male are stunted but mothers eat curd. There are 59.57 per cent female and 59.57 per cent male are wasted but the mothers are eating curd.

TABLE 12 - NUTRITION EATEN AND MALNUTRITION AMONG CHILDREN (PER CENT)

Nutrition eaten	Underweight		Stunted		Wasted	
	Female	Male	Female	Male	Female	Male
Know nutrition	27.97	25.41	23.73	21.52	24.26	26.38
Milk	79.64	79.61	79.66	79.62	69.84	68.65
Curd	49.64	47.88	57.29	58.71	59.57	59.57
Pulses	87.68	83.4	89.15	89.02	82.98	82.98
Beans	84.78	81.85	86.78	88.26	76.6	85.11
Vegetables	99.28	99.23	99.32	99.62	100	100
Fruits	84.57	84.98	72.88	73.18	72.98	49.28
Eggs	76.38	66.91	76.61	65.83	65.74	61.49
Chicken	67.46	68.46	67.97	66.21	67.87	63.62
Meat	67.83	66.14	66.61	63.94	61.49	65.11
Fish	78.55	69.61	78.64	68.14	67.87	70.00

Source: Primary data

Pulses in diet are important to improve nutritional status of all members. Pulses contain protein and vitamins but poor households cannot buy pulses because they are expensive. Nearly 89.15 per cent female and 89.02 per cent male are stunted but the mothers eat pulses. Beans also provide the good nutrition to family members but poverty does not help to buy beans. There are 86.78 per cent female and 88.26 per cent male are stunted but the mothers eat beans. Vegetables are important source of nutrition. Every household member must buy the fresh vegetables from market. All the mothers eat vegetables but the females and males are wasted. We have not asked the quantity of vegetables eaten by mothers. Fruits are good source of vitamins.

There are 84.57 per cent female and 84.98 per cent male are underweight but the mothers eat fruits in regular diet. But buying eggs for the family depends upon the causal income of family. Poverty does not help households to buy eggs. Chicken, meat and fish are good source of nutrition. But families can't buy non vegetarian items because they are too poor. At the same time, buying such items is also depends upon the taste and preferences of the household members. Due to lack of money, they buy less expensive items. There are 76.61 per cent female and 65.83 per cent male are stunted but the mothers eat eggs in diet. The 67.46 per cent female and 68.46 per cent male are underweight but mothers are eating chicken. They are eating non vegetarian food once in a week. There are 67.63 per cent female and 66.14 per cent

male are underweight but mothers are eating meat. Around 78.64 per cent female and 68.14 per cent male are stunted but the mothers are eating fish. Maximum households are eating non vegetarian food once or twice in week. It depends upon their weekly earning. According to them, it is a good source of nutrition.

Family planning methods and malnutrition incidence among children

The family planning methods are important for few and healthy children. They help couples for spacing and limiting children. The mothers of the well-nourished children would have fewer living children and they would have greater knowledge of contraceptive methods. They would be using contraception to a greater extent, and would have experienced more abortions, spontaneous or induced, than the mothers of the malnourished children (MacCorquodale, Donald W. and Haydee Rondon de Nova (1977). The pills help women to extend the pregnancy. It is one of the easily available methods of contraceptive. It is least popular method of family planning in India. Some couples are using the other method of family planning. Such methods are traditional methods and suggested by older people.

TABLE 13 - USE OF FAMILY PLANNING METHODS AND MALNUTRITION AMONG CHILDREN (PER CENT)

Family planning methods	Underweight		Stunting		Wasting	
	Female	Male	Female	Male	Female	Male
Pills	17.54	16.24	17.62	0.00	14.27	0.00
Condom	16.14	14.34	0.00	13.22	0.00	12.22
IUD	3.42	0.00	2.59	0.00	3.6	4.19
Sterilisation	40.54	0.00	40.64	47.52	35.24	0.00
Vasectomy	0.00	1.77	0.00	1.75	1.19	2.12
Periodic absentee	18.41	20.12	19.75	0.00	18.78	0.00
Not known	17.03	12.05	14.35	14.34	12.76	10.63
Others	4.08	5.46	6.06	5.27	10.76	7.51

Source: Primary data

There are 17.54 per cent female and 16.24 per cent male are underweight but mothers use pills as contraceptive methods. Condom is widely used method of contraceptive by male. It helps to family to postpone pregnancies and provide spacing among children. Condoms are available at public health care facility. The private medical shops also sell the condoms. But the use of condom depends upon the education of couple, habits and knowledge and health care access for side effects. The 16.14 per cent female and 14.34 per cent male are underweight but the parents use condom as family planning method. IUD is good option of family planning method. But the women need to go to health care facility and insert IUD. But they do not have access and knowledge of IUD. There are 3.60 per cent female and 4.19 per cent male are wasted but the mothers use IUD as method of family planning.

Sterilisation is most popular method of family planning among women. Women complete the desired family size and perform family planning operation. There are 40.46 per cent female and 47.52 per cent male are stunted but the mothers had sterilisation. Vasectomy is performed by men in slums. But we found very few male have performed the vasectomy. There are 1.19 per cent female and 2.12 per cent male are wasted but father had vasectomy. Periodic absentee is a popular traditional method of family planning. The poor parents often use traditional method. It is not expensive and its use based on mutual understanding of couple. Most of the couples do not know which method of family planning they are using. The husbands use the multiple methods of family planning. Women do not know much about all methods in detail. There are 18.41 per cent female and 20.12 per cent male are stunted but the parents are using the periodic absentee as a method of family planning. Around 17.03 per cent female and 12.03 per cent male are underweight but they don't know any method of family planning. Nearly 10.76 per cent male and 7.61 per cent female are wasted but the parents are using other methods of family planning.

Pre and post natal care for women and malnutrition among children

Antenatal care is most important factor in pregnancy of women. Women must visit at least three times and get the injection, iron folic acid tablets and check-ups. It is good for the health of mother and child. Growth of the child is monitored during these days. But women are involved in work therefore they cannot afford to go for antenatal care. The iron folic acid tablets and injections are not taken on time. Even though they visit, they are not provided ante natal care. It effects on their health and birth weight of baby. The assistance during delivery by medical staff is important for health of mother and child. The health care facilities in suburbs are overcrowded and poor cannot afford to go to hospitals. Therefore births are taking place at home. Therefore no health care assistance is received at home. We asked women that when they provided breast milk immediately after birth of children or not.

TABLE 14 - MATERNAL CARE AND INCIDENCE OF MALNUTRITION AMONG CHILDREN (PER CENT)

Maternal care	Underweight		Stunting		Wasting	
	Female	Male	Female	Male	Female	Male
Antenatal care	51.27	58.75	49.31	54.40	36.17	34.04
Tablets	21.23	25.44	24.74	26.43	24.25	19.14
Inject	33.44	25.83	18.34	16.81	18.51	17.02
Birth assistance: Doctor	26.15	22.70	24.74	21.51	24.25	20.63
Birth assistance: Nurse	16.52	18.49	15.42	15.01	12.76	10.91
Home delivery	26.30	30.46	26.53	29.65	21.27	20.00
Normal delivery	78.62	79.92	78.30	79.92	76.59	31.91
Caesarean	6.36	5.30	4.33	4.08	3.11	4.21
Immediate breastfeeding	82.97	85.71	82.37	86.36	70.21	78.74
Anganwadi food	18.84	19.30	21.01	21.96	10.63	12.76

Source: Primary data

There are 51.27 per cent female and 58.75 per cent male are underweight but the mothers have received antenatal care. A third of pregnant women in India are still not even getting the basic recommended ANC (Sinha, Dipa 2015). Nearly 24.74 per cent female and 26.43 per cent male are stunted but the mothers have received iron-folic acid tablets from health care facility. Around 33.44 per cent female and 25.83 per cent male are underweight but the mothers have received the injections during pregnancy. Around 26.15 per cent female and 22.70 per cent male are underweight but doctor assisted the delivery. The 16.52 per cent female and 18.49 per cent male are underweight and the nurse assisted the delivery. There are 26.30 per cent female and 30.46 per cent male are underweight and the mothers had delivery at home. The 78.30 per cent female and 79.92 per cent male are stunted but the mothers had normal delivery. The 6.36 per cent female and 5.30 per cent male are underweight but the mothers had caesarean delivery. It is recognized that the roots of malnutrition are complex. Sickness, especially measles, diarrhoea and chronic malaria, may precipitate malnutrition; and health workers realize that there may be factors in the social and economic situation of the household which inhibit good feeding. Still, the overwhelming emphasis in nutrition programs is on feeding practices. Proper feeding of children is both the best prevention and the best cure for malnutrition. The women with malnourished children tended to be socially isolated, bitter and passive. The mothers of better nourished children were socially integrated, well-positioned to mobilize support for childcare, and more sensitive to the needs of their children (Simon, Dominique 2002). Nearly 82.37 per cent female and 86.36 per cent male are stunted but the mothers had immediately provided the breastfeeding. The importance of breast milk in the infant diet is well recognised. However it would appear from the evidence outlined above that breast milk continues to make a significant contribution to the complementary diet and thereby growth rate beyond one year, at least in conditions of deprivation. The composition of human milk is influenced by the introduction of non-milk foods to the infant's diet. Protein, fat, iron, and calcium are among the many nutrients that decrease in concentration during the first six months of lactation, with levels that plateau and remain roughly the same during months. However, in underprivileged communities the significant contribution of breast milk to the diet may play an important role in protecting children against malnutrition, particularly where the higher nutritional quality and bioavailability of nutrients in breast milk cannot be matched by complementary foods (Elsom, Rachel and Lawrence Weaver 1999).There are 21.01 per cent female and21.96 per cent male are stunted but they had access to anganwadi food. In India, there is countrywide Integrated Child Development Services Programme (ICDS), whose main objective is the improvement of nutrition of pregnant and lactating women and young children. It operates at the village level and in urban slums through an anganwadi centre (AWC) manned by a anganwadi worker (AWW) who usually belongs to the village and dispenses services, including nutrition supplements to children, and pregnant and lactating

women. The programme began in 1975 in 33 blocks and a few urban areas, and now after 30 years it covers most of the country. It is considered the biggest child welfare programme in Asia and probably in the world. The priority groups are low socio-economic group families, scheduled castes and scheduled tribes. The package of services consists of supplementary nutrition to children and to pregnant women during the last trimester of pregnancy and during lactation, as well as health and nutrition education and some activities for child development. However, the functioning of the programme leaves much to be desired and much of the AWW's time is taken up by routine recording and reporting, and mindless weighing of children (growth monitoring) after which no action is taken or advice given to the caretaker. Her main responsibility should be health and nutrition education, encouraging women to breastfeed exclusively for six months and add semi-solid family food three to four times a day in appropriate quantities after that, which alone can improve nutrition. Teamwork with the auxiliary nurse midwife (ANM) would result in better care of pregnant women, immunisation and management of any illness (Ghosh, Shanti 2004). But in slums ICDS is not effective program. Due to which malnutrition among children is high.

Child malnutrition, illness and treatment:

An environment in slums is not healthy for growth of children. Most of the children have diarrhoea, cough and fever. Prolong period of cough and fever has inverse effect on the nutritional status of children. Most of the children are without medical treatment for cough and diarrhoea in slums of Mumbai Metropolitan Region. Only few children are treated in private and government hospitals. Diarrhoea is another cause of malnutrition and mortality among children. The children have blood in stool due to severe diarrhoea. It effects on the growth and development of children. Most of the parents deny food to children during diarrhoea. Therefore it further deteriorates the nutritional status of the children.

TABLE 15 - INCIDENCE OF ILLNESS AND MALNUTRITION INCIDENCE (PER CENT)

Type of illness	Underweight		Stunted		Wasted	
	Female	Male	Female	Male	Female	Male
Cough	16.88	15.41	15.44	16.06	17.02	16.06
Fever	14.71	14.25	14.75	15.68	14.89	15.68
Treatment in govt hospital	5.80	6.18	3.05	4.17	6.38	4.17
Treatment in pvt hospital	12.17	12.70	11.02	11.52	12.13	11.52
Diarrhoea	12.54	12.32	12.03	10.76	14.26	10.76
Blood in stool	4.72	4.00	3.36	3.38	4.26	4.38
Food taken in diarrhoea	3.72	3.39	2.36	2.38	4.26	4.38

Source: Primary data

There are 16.88 per cent female and 15.41 per cent male are underweight but the children had cough. Nearly 14.75 per cent female and 15.68 per cent male are stunted but they had fever at the time of survey. The 5.80 per cent underweight male and 6.18 per cent underweight female have received treatment from government hospitals. Around 12.17 per cent underweight female and 12.70 per cent underweight male

have received treatment in private hospitals. Total 12.54 per cent female and 12.32 per cent male had diarrhoea but they are underweight. The study found that the primary cause for stunted growth for millions of children in the developing world is poor nutrition resulting in part from frequent bouts of diarrhoea. Repeated bouts of diarrhoea inhibit the ability of the body to absorb nutrition for a much longer period than the duration of the actual diarrheal episodes. Thus, children who survive the risk of dying from diarrheal diseases are at risk of stunting from malnutrition.

There are large economic costs stemming from waterborne diarrheal diseases (Gadgil, Ashok 1998). Total 4.26 per cent female and 4.38 per cent male are wasted but they took food regularly during diarrhoea. Small children do not eat regular food during diarrhoea. Therefore diarrhoea is closely linked with malnutrition, since it prevents adequate absorption of nutrients. The effects of malnutrition are known and severe; they include neurological damage, immune system abnormalities, mental delays, impaired memory, lethargy, and even death. Thus, improving the quality of water could have wider-ranging impacts on nutrition status, beyond any effects on diarrhoea morbidity. The poverty, lack of health care, inappropriate feeding practices leads to malnutrition. The study shows that still breastfed children are lighter and shorter, but not necessarily thinner, than children of the same age who are no longer breastfed.

 Delayed introduction of solids (and the associated delay in learning to eat foods with differing textures) may predispose a child to feeding difficulties later on, resulting in a preference for breast milk (and other liquids) over non-breast milk foods. Thus, a preference for breast milk would lead to continued breastfeeding, while a lack of acceptance of the weaning diet would likely impair growth. However, in some environments infants weaned early may not adapt well to the weaning diet either and may grow more slowly after weaning than their still breastfed counterparts. The influence of early infant health, nutritional status, and feeding decision making, on feeding decisions and child nutritional status months or years later, is not well understood. The children once weaned are not likely to return to breastfeeding (Caulfield, Laura E et.al 1996). In slums, the children's are weaned to early because mothers do not have adequate milk. Small children do not eat food immediately after weaning. Their weight declines fast and they becomes underweight.

3. THE Z SCORE AND UNDER NUTRITION

We have drawn the graphs of z score and underweight, wasting and stunting among children's of slums. Such graphs explain the nutritional status of children as compare to their age.
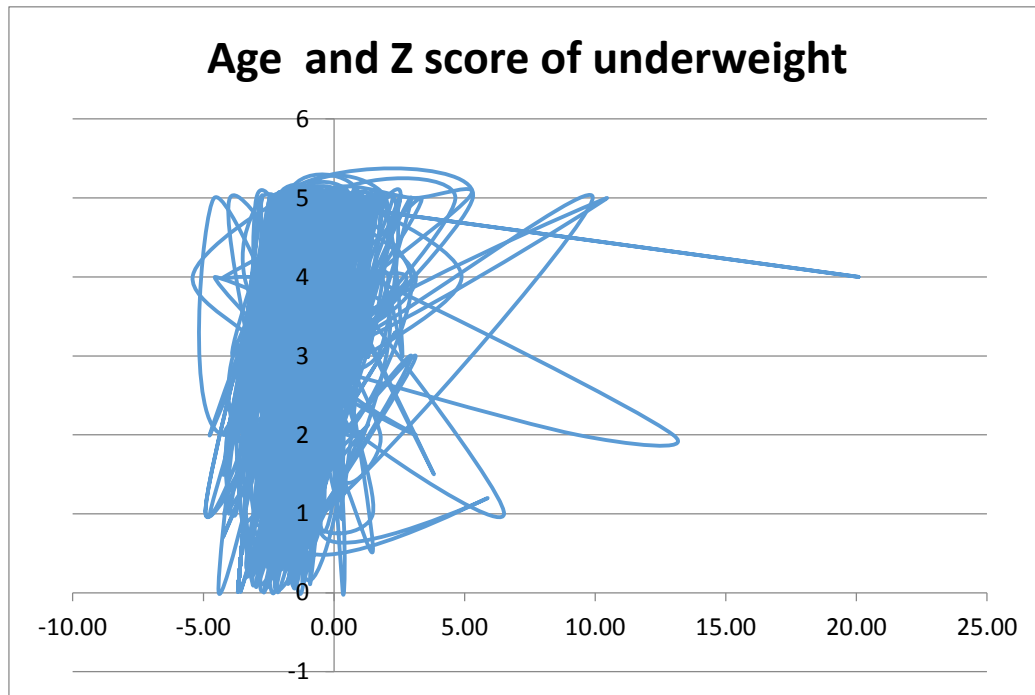
Age and Z score of underweight

FIGURE 1 - THE Z SCORE AND UNDER NUTRITION:

Above figure explains that majority of children falls below one standard deviation to four standard deviation. Very few children fall in zero to one standard deviation. It means majority children have nutrition related problems. We have also presented the relationship of Z score and stunting among children. The majority of children are stunted in slums of region.
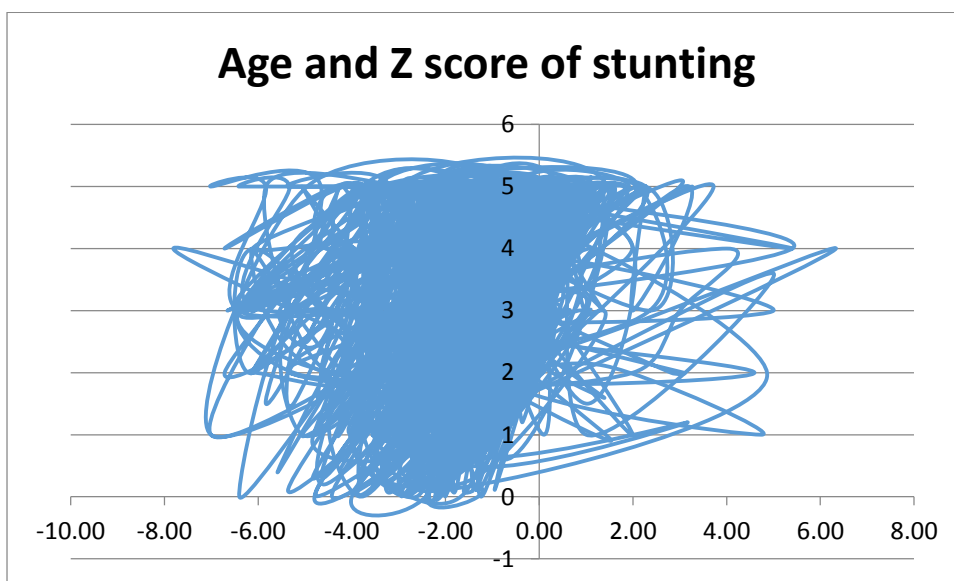
Age and Z score of stunting

FIGURE 2 - THE Z SCORE AND STUNTING:

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POVERTY AND UNDER NUTRITION AMONG UNDER FIVE AGE GROUP CHILDREN IN MUMBAI METROPOLITAN REGION
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Above figure shows that numbers of children are stunted as compare to their age. Most of the children are falling in below two to four standard deviations. The stunting among children occurs because they fall sick again and again and they are not taken to health care facility and doctor. We have also tried to find the relationship between z score of wasting and age of children. It is presented as follows.
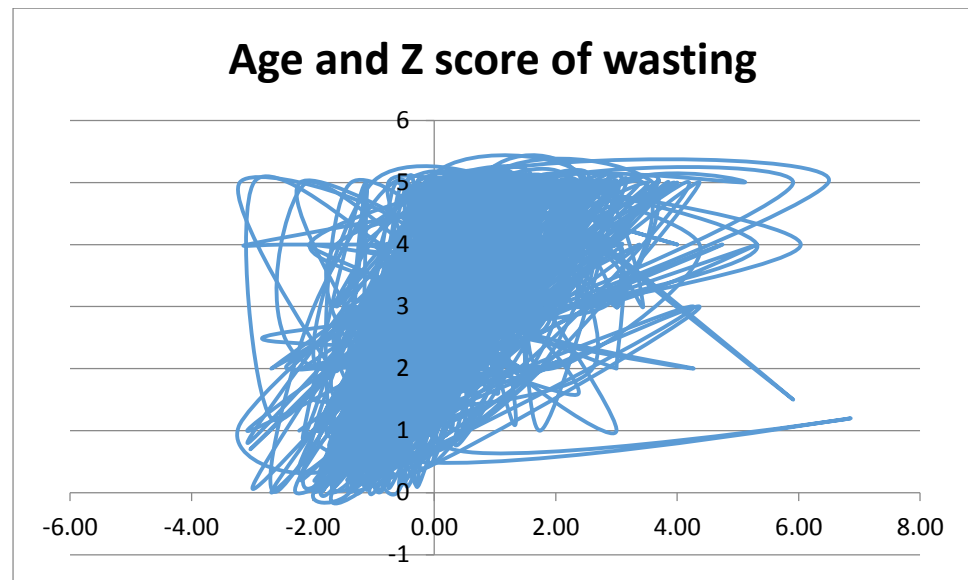

FIGURE 3 - THE Z SCORE AND WASTING:

From the above figure, it is clear that the majority of children have positive Z score. Few children are wasted in slums of region. The wasting among children is acute measure of malnutrition among children. It is very low because there is no short term hunger among children in slums of region.

Malnourished children and deaths in Mumbai Metropolitan Region:

Although rates of child malnutrition in many poor regions of the world have declined in recent years, it remains one of the most significant child health problems with an estimated 53% of child deaths per year attributable to being underweight. Childcare practices are recognised as a key underlying cause (Harpham et.al. 2005). We developed the conditional probability model for malnutrition and deaths among children. The model is given as follows.

$$P(DM/M) = P(DMN/M) + P(DMNM/M)$$

The conditional probability explains that the deaths among children are due to malnutrition and not malnutrition related reasons in Mumbai Metropolitan Region.

$$P(DM/M) = P(DS/M) + P(DW/M) + P(DU/M)$$

The probability of malnourished children dies due to probability of stunting, wasting and underweight in different suburbs. The malnourished children fall sick again and again due to low food intake and health care. They die due to different diseases which are linked to malnutrition.

$$P(TDM/M) = (1/2) * DR * P(DM/M)$$

We assume half of the deaths might be taking place due to malnutrition and related diseases. We have calculated malnourished children and number of deaths of children in Mumbai Metropolitan Region. They are presented in following table.

TABLE 16 - MALNOURISHED CHILDREN AND DEATHS OF MALNOURISHED CHILDREN IN REGION (NO.)

Municipal Corporations	Malnourished children		50 % deaths among children	
	Female	Male	Female	Male
Greater Mumbai	54124	50267	27062	25134
Thane	8010	7440	4005	3720
Kalyan-Dombivali	5426	5039	2713	2520
Navi Mumbai	4874	4527	2437	2264
Mira Bhaynder	35208	32699	17604	16349
Bhiwandi Nizampur	3087	2867	1544	1434
Ulhasnagar	2202	2045	1101	1022
Vasai Virar	5312	4934	2656	2467
Thane district (Municipal councils)				
Ambernath	1103	1024	551	512
Kulgaon Badlapur	758	704	379	352
Nallasopara	1855	1723	927	861
Navghar Manikpur	542	503	271	251
Rigad district				
Alibag	90	84	45	42
Karjat	2621	2434	1311	1217
Khopoli	473	439	236	219
Mathran	26	24	13	12
Panvel	783	727	392	364
Pen	165	153	82	76
Uran	132	123	66	61
Total	126800	117763	63400	58882

Source: Compiled from data

From the above malnutrition incidence among children, we have calculated the total malnourished children and deaths in region. It is based on the per cent of children in population and incidence of malnutrition among children. We assumed that deaths are fifty per cent of total malnourished children. We found 126800 malnourished female and 117763 malnourished male in region. The female are more malnourished than male children in Mumbai Metropolitan Region. Based on different assumptions, we have calculated the malnourished deaths among below five age group children in region. There could be 63400 female and 58882 male deaths in region. Mumbai city is at the top as far as children's malnutrition and deaths are concerned. This is because of high density of population in city.

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)

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

TABLE 17 - INCIDENCE OF UNDERWEIGHT, STUNTED AND WASTED INCIDENCE

Variable	Underweight		Stunted		Wasted	
	Coefficient	Z test	Coefficient	Z test	Coefficient	Z test
Age	-0.361 *(0.04)	-8.85	-0.53* (0.04)	-11.70	-1.16* (0.11)	-9.98
Sex	-	-	0.30** (0.12)	2.43	-	-
Per capita income	-0.00* (0.00)	-3.05	0.00*** (0.00)	1.83	0.00** (0.00)	2.10
Time required for water	-0.01* (0.00)	-6.04	-0.00** (0.00)	-3.14	-	-
Telephone	0.64* (0.14)	4.43	-0.53** (0.15)	-3.37	-	-
Bed	-	-	0.62** (0.18)	3.38	-	-
Television	-0.80* (0.16)	-4.86	-1.30* (0.18)	-7.04	-0.75** (0.31)	-2.43
Bike	-	-	-2.04** (1.11)	-1.83	-	-
Curd	0.34** (0.13)	2.79	0.44** (0.15)	2.79	1.04* (0.27)	3.79
Pulses	-1.03* (0.20)	-4.96	-0.53** (0.22)	-2.42	-0.92** (0.35)	-2.59
Other method of contraceptives	-2.12* (0.44)	-4.77	-0.65** (0.31)	-2.05	-	-
Injections in pregnancies	-0.40** (0.12)	-3.29	-0.84* (0.14)	-5.75	-0.40** (0.20)	-2.00
Age at marriage	-	-	-0.05** (0.02)	-2.62	-	-
Sterilization	-	-	-0.34** (0.14)	-2.38	-	-
Home delivery	-	-	0.71* (0.18)	3.77	-	-
Constant	2.06* (0.27)	7.59	2.61* (0.47)	5.52	0.04*** (0.39)	0.11
	LR Chi^2 =258.17	Prob>chi^2 =0.00	LR Chi^2 =408.01	Prob>chi^2 =0.00	LR Chi^2 =177.57	Prob>chi^2 =0.00
	Log ikelihood =-826.51	Pseudo r^2=0.1351	Log likelihood =-757.92	Pseudo r^2=0.2121	Log Likelihood =-259.41	Pseudo r^2=0.25

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

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. We have used common socio-economic variables to find the co-relation with malnutrition among children.

$$Yi = \beta + \beta1A + \beta2S + \beta3PCI + \beta4TR + \beta5TE + \beta6sBE + \beta7TEL + \beta8B + \beta9C + \beta10P + \beta11M + \beta12I + \beta13AM + \beta14S + \beta15HD + \alpha$$

The results of model are presented in Table 17.

Underweight incidence and correlation factors:

Incidence of underweight is negatively co-related and statistically significant with age of children. It means at lower age, children are not underweight. Most of the children get mothers milk and supplementary diet. Therefore immediately after birth, the underweight incidence is negatively co-related. But in long term, the age may have positive co-relation with underweight children. Per capita income is negatively co-related and statistically significant with underweight. The poor parents of slums have irregular and unstable monthly income. Their daily food purchase depends upon daily earnings. The lower per capita income effects on health inputs. Therefore children are underweight with lower income. Most of the water supply connections are located in slums. Municipal corporations have provided stand posts. But the water supply stand posts are not located near to house. The density of the population is higher. Therefore the time required for water is more. It is statistically significant and positively co-related. The telephone connection is positively co-related with the underweight among children. Few households have telephone connections in slums but children are underweight.

The households of the underweight children eat curd in diets. It is made up of milk at home. Sometimes households also buy curd from sweet shops. Therefore it is statistically significant and positively correlated. The incidence of underweight is negatively co-related with pulses. It means the poor households do not buy pulses and eat as vegetables. It is clearly because pulses are expensive and they are rich source of protein and vitamins. But low income of the households does not support to buy the pulses. The other methods of family planning are not used by the parents of underweight children. They are either using the modern or traditional methods of family planning. They have knowledge of few family planning methods. Therefore other methods are statistically significant and negatively co-related. The pregnant women of the slums do not receive prenatal care. The pregnant women do not get counselling, injections and iron folic acid tablets. It is essential that every pregnant woman must have iron folic acid tablets and injections. But women are involved in daily work. Therefore they do not get time to visit health

care facilities and get the iron folic acid tablets and injections. The pregnancy related injections are negatively co-related and statistically significant.

Stunting and correlation factors

Incidence of stunting is negatively co-related with age of the children and it is statistically significant. At lower age, child growth is maintained but age is not necessarily related to stunting. At lower age, physical growth does not immediately affects. But if the child falls sick again and again and health care is not provided then there is chance that the child will be stunted. Female children are stunted in slums of Mumbai Metropolitan Region and it is statistically significant. Girls are not offered good nutrition through diet. The male are given more preference in families. Good food such as milk, eggs are specially given to boys as compare to girls. Their growth is maintained. If the boys are sick then the appointment of doctor is taken immediately and medical treatment is given on priority basis. But if the girl is sick then immediate and timely medical treatment is not given. It is affecting on their growth. Therefore girls become stunted. Per capita income is significant determinant of the child health status. The poor households do not have enough income. Their jobs are irregular and incomes are also low. They cannot buy the necessary inputs required for the health of the children. They do not have money to go to hospital and treat the children. Without medical treatment and good nutrition effects on the health status of children and they become stunted. Time required for carrying drinking water effects on the health status of children. The municipal corporations have provided water stand posts at particular places. The slum households have to spend more time in carrying drinking water. Most of the time, women and children carry drinking water in slums. They spend more time in carrying drinking water. Telephone connection is provided to fixed structure of house. Most of the houses have kutcha structure. They do not have water supply, electricity and sanitation facility. The slums are illegal in nature. Therefore telephone connection is not given and it is negatively co-related with stunting among children.

The bed in poor households is positively co-related and statistically significant with stunting among children. Chair and table and bed are bought through second hand market. They are also given by the relatives and friends. The plastic chair and bed are cheaper. Therefore they are statistically significant and positively co-related with stunting among children. Television at home is negatively correlated with stunting among children. The poor households do not have money to buy the television. They do not have electricity connection and time to watch television. Therefore it is negatively co-related and statistically significant. Curd is positively co-related to stunted children. The poor households of slums eat curd most of the time in diet. It is least expensive source of vitamin A. Poor people cannot afford to buy non vegetarian food such as eggs, chicken and meat. Therefore eating curd is positively correlated and

statistically significant with stunting among children. The pulses are very expensive. The poor of slums have irregular source of income. They cannot afford to buy pulses. Pulses have good source of vitamins and protein but the poor people cannot afford to buy rich source of nutrition. Therefore eating pulses is negatively co-related and statistically significant with stunted children. Most of the couples use variety of methods as family planning. They are either using modern or traditional methods of family planning. They do not use the other methods of family planning which are suggested by relatives, friends or others. All the pregnant women must get the iron folic acid tablets and injections. It is important for the health of the children. But women do not get the minimum required antenatal care. Therefore it is statistically significant and negatively co-related to stunted children. Women are involved in daily wage earning activities. They do not have time to visit health care facilities and take injections. The bike ownership is negatively co-related with stunting. Most of the households are poor and they do not have money to buy the bike. Therefore it is negatively co-related and statistically significant. Age at marriage is negatively co-related and statistically significant with stunting.

In slums, households are poor, the parents force the girls to get marry early and it is before 18 years. At early age, their physical growth does not take place. The early pregnancy leads to stunting among children. Sterilisation is negatively co-related and statistically significant with stunting among children. Women have not done sterilisation and they are using traditional or modern methods of contraceptives. The home deliveries are positively co-related and statistically significant with stunting among children. These women do not go to health facility and register themselves for health care. It is affecting on the health of mothers and children. Therefore it is positively co-related and statistically significant with stunting among children.

Wasting and correlation factors

The incidence of wasting is negatively co-related with age of children. At lower age, wasting among children is not immediately observed. This is mainly because after birth children get mothers milk and supplementary diet. Therefore children do not fall sick immediately after birth. But in the long term, wasting among children could be observed. Therefore age of the child is negatively co-related and statistically significant with wasting among children. The households are poor in slums. They do not have regular income. The jobs are daily wage earning work. Therefore income earned at the end of the month is low. Therefore lower income is negatively co-related with wasting among children. The ownership of the television is negatively co-related and statistically significant with wasting among children. The households in slums are very poor. They cannot afford to buy the television. Television also required regular electricity and cable connection. But irregular income does not support them to buy the television

and see the different programs daily. The relationship of curd with the wasting among children is negatively co-related and statistically significant. Households buy milk and prepare curd from it. They also occasionally buy curd from shops. It is an important source of vitamin A. Therefore they take it in diet. The pulses are negatively co-related with wasting among children. The family members have irregular source of income. They cannot buy pulses. They are expensive source of protein and vitamins. Most of the women are involved in daily wage earning. They do no find the time to visit public health care facilities. Health care facilities are overcrowded and visiting health care facilities required time. Therefore most of the pregnant women skip the injections and iron folic acid tablets. Therefore it is statistically significant and positively co-related with wasting among children.

4. CONCLUSIONS

Despite significant progress in the fight against malnutrition, large populations in low- and middle-income countries are suffering from hunger and micronutrient deficiencies (Lachat 2013).There is need of long and short term comprehensive policies to tackle malnutrition among adults and children of slums in Mumbai Metropolitan Region. 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.

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 and children. 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.

The small children are not breastfeed properly and provided the supplementary diet. This is because women of slums are involved in work. According to the guidelines, a child in the age range 6–23 months should be fed from four or more different food groups in addition to breast milk. Further, a child who does not receive any breast milk should be fed from four or more food groups and should also receive milk or milk products on a daily basis (Malhotra, Nisha (2010).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 and children.

There should be political commitment to improve nutritional status of adults and children 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 and children in region at some extent.

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