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Child Malnutrition and Low Access to Health Care Facilities in Mumbai Metropolitan Region

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Abstract- The child malnutrition is widely viewed in slums of Mumbai Metropolitan Region. The incidence of underweight and stunting is higher among female as compare to male. The undernourishment among children is related to parent's education and health status. Media exposure and health care access is low among women. Most of the women are working as unskilled labors in suburbs. Child care does not exist across the slums. The women have to keep children at home, relatives or neighbors. Most of the undernourished children have cough, cold, fever and diarrhea. But few children are treated in public health care facilities. The logistic regression shows that underweight among children is negatively co-related with age, mothers normal BMI, ANC and anganwadi food. Stunting is negatively co-related to age, mother's secondary school, per capita income, ANC, normal delivery and anganwadi food.

Keywords: *health care, sanitation, water supply.*

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Child Malnutrition and Low Access to Health Care Facilities in Mumbai Metropolitan Region

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Abstract- The child malnutrition is widely viewed in slums of Mumbai Metropolitan Region. The incidence of underweight and stunting is higher among female as compare to male. The undernourishment among children is related to parent's education and health status. Media exposure and health care access is low among women. Most of the women are working as unskilled labors in suburbs. Child care does not exist across the slums. The women have to keep children at home, relatives or neighbors. Most of the undernourished children have cough, cold, fever and diarrhea. But few children are treated in public health care facilities. The logistic regression shows that underweight among children is negatively co-related with age, mothers normal BMI, ANC and anganwadi food. Stunting is negatively co-related to age, mother's secondary school, per capita income, ANC, normal delivery and anganwadi food. Stunting is positively co-related with father's moderate BMI. Therefore the policies are required to provide basic amenities such as health care, water supply, sanitation and electricity in slums. Government and NGO's must prepare the maternal child health related programs and run on television and radio. The state government must provide vocational training to youths. Such policies will reduce the malnutrition among children at some extent in slums of Mumbai Metropolitan Region.

Keywords: health care, sanitation, water supply.

I. Introduction

Malnutrition among children is the world's most serious health problem. It is the single biggest contributor to child mortality. Nearly one-third of the children in the developing world are either underweight or stunted and more than thirty per cent of the developing world's population suffers from micronutrient deficiencies. Asia continues to have both the highest rates and the largest numbers of malnourished children in the world (Khan A.A. et.al 2006). In India, half of the children are malnourished. Poor growth is attributable to a range of factors closely linked to overall standards of living and the ability of populations to meet their basic needs (Joshi H. S.et.al 2011). The malnutrition among children has short and long term effects.

Malnutrition affects physical growth, morbidity, mortality, cognitive development, reproduction, and physical work capacity, and it consequently impacts on human performance, health and survival. It is an underlying factor in many diseases for both children and adults (Salah E.O. et.al. 2013). The malnutrition not only affects individual but its effects are passed from one generation to the next generation. The malnourished mothers give birth to infants who struggle to survive and develop. If these children are girls then they often grow up to become malnourished mothers themselves. Therefore malnutrition among children is a long term issue (Gillespie and Haddad 2003).

Maharashtra is one of the highly industrialized and economically developed states of India. Mumbai Metropolitan Region is the centre of commercial and economic activities in Maharashtra. The higher incidence of malnutrition among children is not expected in this region. But there is rapid migration of rural people into the metropolitan region. It has put extensive pressure on existing civic amenities. The demand for housing is not equal to supply of housing. It has resulted in higher prices of houses. The poor people cannot afford the good housing at lower price in region. It has resulted into the development of slums in a large number of places within the region. The density of population is always high in the slums (Haque et al. 2014). It has resulted into overcrowding, unhygienic and poor sanitary conditions, along with economic insolvency. Therefore it leads to malnutrition and poor health conditions of children. The health care facilities, water supply, transport are spread unevenly in suburbs. Such amenities have effects on the nutritional outcome of children. At early age, children are affected adversely due to unhygienic environment in slums. The physical growth of the children has affected due to lower socio-economic status of families and infrastructural facilities. Low educational status of parent does not support children to grow with good nutritional status. Educated mothers understand the importance of medicines and access various community level services. Similarly, educated mothers are more conscious about their children's health; they tend to look after their children in a better way. Health status of the father is important to earn higher income. Usually father is the main earner and decision maker of a family and so their higher level of education plays an important role to ensure better nutritional status of children. Healthy mothers take good care of their children. They can breastfeed for longer duration and provide adequate supplementary food. For smaller children, continuous emotional and physical care is required at early stage. The malnourished

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mothers cannot provide sufficient breastfeeding because of their nutritional deficiency. Mass media provides knowledge of breastfeeding, antenatal, postnatal care and immunization. Women are expected to get knowledge through newspaper, radio and television. There are number of programs shown for women and children on television and radio. The pregnant women should get at least four antenatal check up and medicines such as folic acid tablets and injections. But the women with low status tend to have weaker control over household resources, tighter time constraints, less access to information and health services, poorer mental health, and lower self-esteem. These factors are thought to be closely tied to women's own nutritional status and the quality of care they receive and in turn to children's birth weights and the quality of care they receive (Smith et. al.2006).

Child care does not exist across slums. Women are required to carry their children to work. There are no separate arrangements for child care at slums or at work. At work, they need to provide care and breastfeed to children. If it is not possible at work then children are required to keep with relatives or neighbors. They remain without care and supplementary food. It is further deteriorates their health status and condition. Most of the children in slums are suffering from cough and cold, fever and diarrhea. Children do not get proper treatment from health specialists. The public health care facilities are overcrowded and inefficient staff exists in it. In order to provide health treatment to children, more time and physical energy of mothers is required. The private health care facilities are expensive and beyond the reach of poor people. The women and children are carrying drinking water from long distance. It affects on income generating activities of women. The study of children also gets affected in slums. Most of slums are facing various infrastructural problems in region.

II. Data

For this study, we have collected primary data of slum households in Mumbai Metropolitan Region. We have collected 767 households data from eight slums such as Mankhurd East and West, Govandi East and West, Kalwa, Koparkhairne , Rabale, Turbhe, Vashi and Ghatkopar. The household heads and women are interviewed during survey. The questionnaire comprises as different questions related to household members, fertility, immunization, child care and illness. The primary data is collected in May-June 2014. We have analyzed data in SPSS@20 and STATA@12 software. The children's weigh for age, height for age and weight for height is calculated in the excel sheet.

III. Methodology

The nutritional status of children is mainly expressed in terms of height for age and weight for age. We compared the child's weight and height with reference population. It is given by the World Health Organization (WHO). Children who are too short for their age are called stunted. The height for age reflects a child's past or chronic nutritional status. The stunting is also called as the cumulative indicator of slow physical growth. The children who become stunted typically remain so throughout their lives and thus never catch up. The child, whose weight is too low for their age is called as underweight.

IV. The Z Score

The weight for age and height for age indicators are commonly expressed in the form of Z score (Harold 2000; Kostermans 1994; Galloway 1991; Giliespie and Lawrence 2003). This score compares a child's weight and height with the weight and height of a similar age and sex of 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 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 concern indicator of the children of that age/sex group from the standard population.
Mathematically,

$$\text{Z score} = \frac{C_{av} - M_{rf}}{SD_{rf}} \quad (1)$$

Where

C_{av}: Child's anthropometric value

M_{rp}: Median of reference population

SD_{rf}: Standard deviation of reference population

It is assumed 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. The 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 child of the same age and sex from a healthy reference population. 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 stunting measures in the long run social condition because it is reflecting past nutritional status. Thus the WHO recommends it as a reliable measure of overall social deprivation (Glewwe et al., 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 World Health Organization (WHO), United Nations International Children's Emergency Fund (UNICEF) and other international organizations concerned with the health status of children.

V. Economic Model

The child malnutrition is classified as stunting, underweight and wasting. In this study, the malnutrition is classified as follows.

$$M=(U,S) \quad (2)$$

Malnutrition among children is classified as stunting and underweight in Mumbai Metropolitan Region.

$$M=(Pe,Pn,Ha,Cu,Hc,Cc,Ci) \quad (3)$$

Malnutrition among children is a function of household characteristics. It is related to parent's education (Pe), nutritional status (Pn), household assets (Ha), contraceptive use (Cu), health care (Hc), child care (Cc) and child illness (Ci). Such factors are further divided into number of sub factors as follows.

$$Pe=(P,S,Hs,C) \quad (4)$$

Parent's education is considered as mothers and fathers educational attainment and it is considered as primary, secondary school, high school and college education.

$$Pn=(S,Mo,Mi,N) \quad (5)$$

Parent's nutritional status is classified as normal, mild, moderate and severe malnourished. It is measured in terms BMI. The BMI of parents is defined as weight divided by height (m) square.

$$Ha=(Ph,E,V) \quad (6)$$

Household assets are classified as physical assets, electronic goods and vehicles.

$$Cu=(M,T) \quad (7)$$

Contraceptive use by parents is classified as modern and traditional contraceptives. The modern contraceptives comprises as pills, condoms, IUD and family planning operation. The traditional contraceptives comprises as periodic absentee and withdrawal method. Parents use suitable contraceptive method for spacing among children.

$$Hc=(A,D,I) \quad (8)$$

Health care access comprises as the ANC to pregnant women, delivery conducted in hospital and care during illness.

$$Cc=(B,F,C) \quad (9)$$

Child care comprises as the breastfeeding, supplementary food and care.

$$Ci=(C,F,D) \quad (10)$$

Child illness comprises as the cough and cold, fever and diarrhea.

All the factors are interlinked with each other but finally they decide the nutritional status of children.

VI. Incidence of Child Malnutrition in Mumbai Metropolitan Region

We have classified children according to the current nutritional status and the suburbs. The number of wasted children was very low therefore they are not reported in the table. The incidence is shown for eight suburbs in metropolitan region.

Table 1 : Incidence of malnutrition among children (percent)

Suburb	Underweight		Stunting	
	Boys	Girls	Boys	Girls
Mankhurd(E)	14.29	0.00	21.43	7.14
Mankhurd (W)	0.00	11.54	4.17	11.54
Govandi (E)	6.25	20.00	12.50	20.00
Govandi (W)	0.00	3.33	6.45	6.67
Kalwa	2.42	10.58	5.65	14.42
Koparkhairn	0.00	16.00	8.00	32.00

Rabale	0.00	0.00	0.00	7.69
Turbe	11.76	4.00	20.59	16.00
Vashi	0.00	14.29	0.00	28.57
Ghatkopar	28.57	0.00	0.00	0.00
Total	4.17	8.76	8.33	14.74

Source: primary data collected

In Mankhurd (E) 14.29 percent boys are underweight. In the same suburb, 21.43 percent boys are stunted. In Mankhurd East and West, 11.54 percent girls are underweight and stunted. In Govandi (E), 20 percent girls are underweight and stunted. In Govandi (W), total 6.67 percent girls are stunted. In Kalwa, 14.42 percent girls are stunted. In Koparkhairne, total 32 percent girls are stunted. It is the highest incidence of stunting among girls in this suburb. In the same suburb, only 16 percent girls are underweight. In Rabale, only 7.69 percent girls are stunted. In Turbhe, 20.59 percent boys are stunted. In Vashi, 28.57 percent girls are stunted. In Ghatkopar, 28.57 percent boys are underweight. It is the highest incidence of underweight among boys as compare to other suburbs. We found that total 8.76 percent girls are underweight whereas 4.17 percent boys are underweight. Nearly 8.33 boys and 14.74 percent girls are stunted in metropolitan region. It is clear that the incidence of stunting among boys and girls is higher in slums. It means children are not provided health care during different kinds of illness. Therefore it has affected on their physical growth. Stunting is a cumulative and long term indicator of child malnutrition.

a) Parent's education and nutritional status of undernourished children

The parent's education and nutritional status are the key determinants of the child nutrition. Low education and nutritional status is the prime cause of child malnutrition. Such factors cannot be ignored in this study.

Table 2 : Parents education and malnutrition among children (percent)

Parents education	Underweight	Stunted
Mother		
Illiterate	17.65	28.33
Primary	2.94	6.67
Secondary	8.82	3.33
High school	0.00	0.00
College	0.00	0.00
Father		
Illiterate	17.65	26.67
Primary	0.00	0.00
Secondary	14.71	15.00
High school	2.94	1.67
College	0.00	0.00

Source: As per table one

The literate mothers can understand the nutritional requirement of children. But illiterate mothers may responsible for malnutrition among children. Among illiterate mothers, the incidence of underweight is 17.65 percent and incidence of stunting is 28.33 percent. The primary studied mothers, the incidence of underweight among children is only 2.94 but the incidence of stunting is 6.67 percent. Those mothers are secondary studied the incidence of underweight is 8.82 percent whereas the incidence of stunting is 3.33 percent. We have not found any incidence of child malnutrition with high school and college education of mothers. If the father is illiterate then the incidence of underweight among children is 17.65 percent. The incidence of stunting is 26.67 percent. Those fathers are secondary studied then the incidence of underweight is 14.71 percent. The incidence of stunting is 15 percent. Those fathers are high school studied, the incidence of underweight is 2.94 percent. The incidence of stunting is 1.67 percent. It is clear that the illiteracy among parents is the prime cause of malnutrition among children. As the education of parents increases, the incidence of malnutrition among children declines fast.

Table 3 : Parents nutritional status and malnutrition among children (percent)

BMI category	Underweight	Stunted
Mothers		
Severe	5.88	5.00
Moderate	2.94	1.67
Mild	5.88	5.00
Normal	2.94	15.00
Fathers		
Severe	0.00	1.67
Moderate	0.00	1.67
Mild	0.00	0.00
Normal	2.94	13.33

Source: As per table one

Those mothers are severely malnourished the incidence of underweight is 5.88 percent but the incidence of stunting is only 5 percent. The moderate malnourished mothers have 2.94 percent incidence of underweight. Those mothers have mild BMI, the incidence of underweight is 5.88 percent whereas the incidence of stunting is 5 percent. It means mothers with severe and mild BMI have similar underweight and stunting incidence among children. Those mothers have normal BMI, the incidence of underweight is 2.94 percent whereas the incidence of stunting is 15 percent. Those fathers have mild and moderate BMI, the incidence of stunting is observed as very low. The incidence of stunting is 13.33 percent if the father has normal BMI. We found that mothers and fathers normal BMI has no relationship with stunting among children. Stunting is related to health care access and not BMI of mother and father. Above table shows that children are not treated in health care facilities. Most of the public health care facilities are overcrowded and visiting such facilities required more time. Poor families have high opportunity cost of time. Therefore they avoid visiting health care facilities.

b) Household characteristics and under nutrition among children

We have classified the household characteristics of underweight and stunted children. They are determinants of malnutrition among children.

Table 4 : Water requirement to family of undernourished children (percent)

Drinking water	Underweight	Stunting
Daily per capita water requirement (Liters)	113.73	126.63
Per capita drinking and cooking water (liters)	7.74	8.43
Trips required(No)	4.82	4.47
Trips by women(No)	4.03	3.82
Trips by children (No)	0.32	0.31
Trips by others(No)	0.29	0.23

Source: As per table one

The daily per capita norm of drinking water is 135 liters. But all the slum households get less drinking water. Among the underweight children, the daily water availability is 113.73 liters for drinking and cooking. Among stunted category, it is 126.63 liters. Total 4.82 trips are required to carry water among underweight children. For stunted, it is 4.47 trips. The women carry 4.82 trips in undernourished children category. For stunted children, it is 3.82 trips. The young children carry water and it is 0.32 trips in undernourished category whereas in stunting category, it is 0.31 trips. The other family members also carry water but the numbers of trip are very low.

Table 5 : Household assets of undernourished children (percent)

Household assets	Underweight	Stunting
Cooker	47.06	51.67

Chair and table	17.65	15.00
Watch	23.53	23.33
Electricity	73.53	68.33
Bicycle	2.94	6.67
Swing machine	0.00	0.00
Radio	2.94	3.33
Telephone	29.41	33.33
Refrigerator	0.00	1.67
Television	52.94	48.33
Bike	0.00	1.67
Car	0.00	1.67

Source: As per table one

Household assets are important to improve nutritional status of children. Households have cooker but 47.06 percent children are underweight and 51.67 percent are stunted. Households have chairs and table but 17.65 percent are underweight and 15 percent are stunted. Households have watch but 23.53 percent are underweight and 23.33 percent are stunted. Total 73.53 percent households have electricity but children are stunted. In case of stunting category, it is 68.33 percent. Only 2.94 percent households with underweight children have bicycle. Among stunting category, it is 3.33percent. Household with malnourished children do not have swing machine. Only 2.94 percent households with underweight children have radio. In case of stunted children, it is 3.33 percent. Total 29.41 percent households with underweight children have telephone. In stunting category, it is 33.33 percent. In our sample only 1.67 percent households with stunted children have refrigerator at home. Refrigerator is important in house because it is useful to preserve food for longer time and provide nutritious food to children on demand. Total 52.94 percent households have television but children are underweight. In case of stunting category, it is 48.33 percent.

The contraceptive methods are important to plan number of children. Modern contraceptives are reliable because failure rate is low. But knowledge of modern contraceptive among poor parents is low.

Table 6 : Contraceptive use and nutritional status of children (percent)

Contraceptive use	Underweight	Stunted
Pills	17.65	8.33
Condom	11.76	11.76
IUD	0.00	0.00
Sterilization	23.53	25.00
Vasectomy	0.00	1.67
Periodic absentee	27.59	27.78
Withdrawal method	20.59	23.33

Source: As per table one

Women are taking pills but 17.65 underweight and 8.33 percent are stunted. Women's use condom as family planning method but 11.76 percent children are underweight and stunted. Women do not use IUD in slums. Such method required to visit health care facility and take precautions. Women do not time for repetitive visits to health care facility. Women had sterilization but total 23.53 percent are underweight and 25 percent are stunted. Only 1.67 percent fathers had vasectomy but children were underweight. Families use periodic absentee method but 27.59 percent are underweight and 27.78 percent children are stunted. The withdrawal methods are used by parents but 20.59 percent children are underweight and 23.33 percent are stunted. It is clear that most of the parents rely on traditional method of contraceptives. For use of modern contraceptives, knowledge, money and consultation with heath staff is required. But it is not possible with poor parents.

The health care access to pregnant women is most crucial to reduce malnutrition among children in slums. But there are number of factors responsible for lower access of ante natal care and delivery in health care facility.

Table 7 : Health care access for undernourished children (percent)

Health care access	Underweight	Stunted
Ante natal checkups received	17.65	21.67

Average ANC trips	1.94	2.26
Injections	52.94	65.00
Tablets	17.65	28.33
Delivery in public hospital	67.65	56.67
Normal delivery	94.12	86.67
Caesarian	2.94	6.67

Source: As per table one

Women had antenatal check up but the 17.65 percent children are underweight and 21.67 percent children are stunted. Among underweight children, women had less than two ante natal check ups whereas among stunted category, it is more than 2 ante natal visits. Total 52.94 percent women of underweight children category had received injections. For stunting, it is 65 percent. Only 17.65 percent women received tablets but children are underweight. In the stunting category, it is 21.67 percent. Total 67.65 percent women had delivery in public hospital but the children are underweight. For stunting, it is 56.67 percent. Total 94.12 percent women had normal delivery but children were underweight. For stunting, it is 86.67 percent. Total 6.67 percent children are stunted but women had caesarian.

Table 8 : Breastfeeding, care and under nutrition (percent)

Breastfeeding and care	Underweight	Stunting
Immediate breastfeeding	73.53	81.67
Still breast feeding	76.47	70.00
Breastfeeding and supplementary food	20.59	25.00
Anganwadi food	2.94	5.00
Care		
At home	67.65	65.00
On work	2.94	1.67

Source : As per table one

Children must be provided breastfeeding immediately after delivery. They must be exclusively breastfeed up to six month. After six month, they must be provided supplementary food along with breastfeeding. In our study, 73.53 percent women have immediately breastfeed their baby after delivery. In stunted category, it is 81.67 percent. Total 76.47 percent underweight children are still breastfeed by mothers. For stunting, it is 70 percent. Only 21 percent underweight children have given the breastfeeding and supplementary food. For 25 percent stunted children have given breastfeeding and supplementary food. Only 2.94 percent underweight children have given anganwadi food. The 5 percent stunted children have received anganwadi food. It means very few children have access to anganwadi food. Total 67.65 percent underweight children are kept at home. This is because there is no care exists at work place. Total 2.94 percent underweight children are on work with their mothers. In stunting category, it is 1.67 percent.

Table 9 : Child illness and treatment to malnourished children (percent)

Child illness	Underweight	Stunting
Cough	20.59	21.67
Fever	20.59	20.00
Diarrhea	8.82	11.67
Blood in stool	2.94	5.00
Treatment in public health care	5.88	3.33

Source : As per table one

Children must be health and they should not suffer from any illness. Illness among small children affects physical growth and weight gain. During illness if the health care is not provided then they become malnourished. In this sample, we found that total 20.59 percent underweight and 21.67 percent stunted children had cough. Around 20 percent underweight and stunted children had fever. Around 8.82 percent underweight children had diarrhea. In stunting category, it is 11.67 percent. Total 5 percent stunted children had blood in stool. Only 5.88 percent underweight children received treatment from public hospitals. For stunting, it is only 3.33 percent. It means very few malnourished children get treatment from the health care facility.

VII. Regression Result

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

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

$$= 1/1+e^z$$

$$Z=\beta_0+\beta_1x_1+\beta_2x_2+\beta_3x_3+\ldots\ldots\ldots+\beta_kx_k, \quad (11)$$

Where

Z = Dependent variable

β_0= Intercept

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

Table 10 : Regression results for underweight children

Variables	Co-efficient	S.E	Wald
Age	-1.75*	0.33	27.63
Mothers normal BMI	-2.28*	1.04	4.8
ANC	-0.19*	0.11	3.13
Anganwadi food	-1.76**	1.08	2.81
Constant	0.51***	0.4	1.61
	- 2log likelihood=158.86	Cox and Snell R^2 square=0.16	Nagelkerke R^2= 0.43

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

Age of the child is negatively co-related with underweight. At lower age, children in slums are more vulnerable. The odd is 75 percent negatively related with underweight children. The socio-economic conditions are not favorable in slums for child growth. At lower age or after birth, the child is exposed to unclean environment and unsafe drinking water, sanitation. Such factors adversely affecting on weight gain of small children in slums. Most of the mothers in slums do not get adequate food and rest. It is basic requirement of mothers. They breastfeed their children, but they need to work at home and on daily wage. Their body does not support the physical hardship. Therefore the BMI of women is always lower. It is negatively co related to underweight among children and the odd ratio is 2 times negatively co-related. Women in slums do not get all the antenatal checkups. It is negatively co-related and the odd is 19 percent less because they do not get the antenatal care. After conception, women are expected to visit health care facility. They must get the iron, folic acid tablets and injections as well as physical checkups. Such ANCs and checkups are completed in three visits. For complications, number of visits can be more. But women in slums do not have time to visit health care facilities. Families are often depending upon home remedies. Government of India has established Anganwadi centers in all states in India. Such centers are expected to provide food, measure weight, height and provide medical care to small children. The underweight children have not received food and medical care. The odd is one and it is negatively co-related. We have used logistic regression for stunting among children to understand co-relation with household factors. The results are reported in the table.

Table 11 : Regression results for stunted children

Variables	Co-efficient	S.E	Wald
Age	-1.66*	0.23	51.19
Mothers secondary school	-2.21*	0.81	7.6
Mothers moderate BMI	-2.18***	1.31	2.78
Fathers moderate BMI	3.22*	1.36	5.59
Per capita income	-0.01*	0.00	5.33
ANC	-0.426*	0.19	4.9
Normal delivery	-0.89**	0.52	2.94

Anganwadi food	-1.57*	0.65	5.82
Constant	2.66*	0.75	12.54
	- 2log likelihood= 232.08	Cox and Snell R^2= 0.24	Nagelkerke R^2= 0.47

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

Lower age of the child has more chance of stunting. The odd ratio is 1.66 and negatively co-related with age of children. The parents do not health care treatment to children. The health care facilities are overcrowded. The parents are poor therefore they have high opportunity costs to visits such health care facilities. Most of the mothers are less educated in slums. The odd is 2 times less of secondary school of mother's education. Educated mothers can provide health care and nutrition to children. It helps children to achieve adequate growth at lower age. But lower education of women is responsible for stunting among children. Most of the women do not have normal BMI is slums. Normal BMI is essential for good health of child. The odd ratio is 2 and it is negatively co-related with moderate BMI of mothers. Such low and negative relationship of mothers BMI do not help for adequate growth of children. Fathers BMI is co-related with stunting of children. The odd ratio is 3 and it is positively co-related with stunting among children. Fathers normal BMI helps to earn more income and provide nutrition to small children. But low BMI has effect on child health. Per capita income of family is sole determinant of child malnutrition. The odd is negatively co-related with stunting among children. Higher per capita income helps families to spend more on food, care, medicine and household assets. But lower per capita income does not support various basic necessities required for families. Therefore parents cannot spend money on child health care and supplementary food. Therefore PCI negatively co-related to stunting among children. Those women have not received the ANC, the stunting among children is 42 percent more. During ANC, the folic acid tablets and injection are given to pregnant women. Similarly the women are treated with complications and any deficiency of nutrition. But no ANC means children are exposed to malnutrition. Most of the women in slums do not have adequate body growth. They get marry early and get pregnant. It affects on the health of children. Most of the times complications occur when the girls get marry early. The cesarean type of delivery affects on mother and child health. The women do not have normal delivery and stunting is 89 percent more with stunting among children. Children do not get anganwadi food. The stunting is two times more with no anganwadi food. Anganwadi food is most important for child health. Physical checkups, supplementary food are most important for good child growth. But women in slums do not have time for children and send regularly them to anganwadi. They are busy with household chores and daily wage earning.

VIII. Policy Implications and Conclusion

This study shows alarming results of malnutrition among children in region. The incidence of stunting is higher among females. The incidence of stunting is double of underweight among male in suburbs. The literacy among mothers and fathers are lower. The lower BMI of parents is related to under nutrition among children. Only few women read newspaper and watch television in slums. Most of the women delivered baby in public health care facilities. Women in slums do not have access to child care. While working, they keep their children at home. Most of the children are suffering from cough, cold and fever. They are treated in public health care facilities. The high levels of malnutrition in the present study underline the great need for nutritional intervention. Therefore timely introduction of appropriate complementary feeding is a key factor in child growth. The complementary foods should be given to the children as from six months old. Nutrition education is the most sensitive factor that is needed by all mothers in slums. It is because this will keep them informed about the right food for them and their children at different stages of life and from there better living can be assured that will give the assurance of a better nutritional status for mothers and their children. All the households in slums must have access to health care, sanitation and electricity. The maternal child health care must be given priority in slums of Mumbai Metropolitan Region. Government must sanction more anganwadis in slums of Mumbai Metropolitan Region. Government and NGO's must prepare maternal child health related program and run on television and radio. It will help to spread information and awareness of child and maternal health among poor people. Public health care facilities must provide modern contraceptives in slums. It will help couples to keep proper space between the children. It will help to reduce the malnutrition among children. Government and NGO's must work to increase the age of marriage of girls in slums. Mother's body must supply her baby with everything it demands. Thus the mother's micronutrients level directly affects her baby's development. When it comes to eating and drinking, what is good for a mother also benefits her child. This

natural fact therefore helps mothers to positively influence their baby's growth and development as well as baby's long term health and well being (Opara et.al 2011). Adolescent girl's education is most important aspect in this direction. The poor urban slum girls must be given scholarship to continue education. There are number of alternative policies such as better strategic interventions for nutritionally vulnerable population, adequate investment in terms of technology and implementation of evidence based strategies and comprehensive evaluation of programs by the government and development partners. It will no doubt achieve improvements in nutrition of mothers and children (De Silva A. et.al 2009). Similarly women need to strengthen their nutrition care knowledge, attitude and practice, especially breastfeeding and weaning practice. It is the key to achieve better nutrition status of their children. The development and implementation of health education intervention should include the participation of targeted mothers in order to understand their needs. Health communications should be in a format that attract community and appropriate with the local culture and language. Art-based communication activities such as singing, drama contest, and roll-play are important. The municipal corporations must be give the priority to improve standard of living of people. The illegal status of the slum has hindered the expansion of municipal services to serve them. This has resulted to the poor being denied access to safe drinking water and proper sanitation. The results suggest that water from the tap is safe for human consumption according to WHO guidelines (Wambui E et.al 2007). But most of the slums are neglected the safe drinking water supply, sanitation, solid waste, roads and electricity. The nutrition programs should be established in slums to tackle the problem of malnutrition at community level. Nutrition education by health extension works should be strengthening to improving the feeding practice of parents on appropriate children feeding. Households should treat drinking water by boiling, bleaching and strained through cloth (Kebede et.al. 2013). Government must focus on income generation activities at household level. Government must train youth and women with basic skills. It will help to improve family income and reduce incidence of malnutrition. All the policies will certainly reduce the child malnutrition at some extent in Mumbai Metropolitan Region.

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