

Level Of Infant Mortality And Its Determinants: A Case Study Of The Slum Dwellers Of Assam

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Abstract: Slum dwellers are an inevitable part of urban society, but due to their poor economic condition they are far, far away from enjoying the basic amenities of life, especially the medical facilities, which ultimately affect on their health status. Therefore, through this paper an attempt has been made to analyse the level of infant mortality and the factors responsible for determining the level of infant mortality of the slum dwellers of Assam. It is found from the study that the infant mortality level of the slum dwellers of Assam is higher than the state average. Among the various determinants, only two determinants i.e. place of delivery (PD) and starting time of breast feeding (BF) are found to be significant factors in determining infant mortality.

Keywords: Slum Dwellers, Infant Mortality, Determinants of Infant Mortality.

I. INTRODUCTION

The study of mortality deals with the effects of death on population. A death can occur only after a live birth, and the span between birth and death is life. The study of mortality is useful for analysing current demographic conditions as well as for determining the prospects of potential changes in mortality conditions of the future (Bhende and Kanitkar, 1994). Those who live in neat and clean environments and atmosphere are less prone to death as compared with those who habitually live in dirty atmosphere. Several surveys conducted have established that those living in 'jhuggis' and shanties under unhygienic conditions die earlier than their counter- parts in cleaner environments (Raj, 1995). The death rates especially the infant and child mortality rates are high in developing countries as compared to those of the developed countries. In this paper an attempt has been made to study the level of infant mortality and the factors responsible for determining the level of infant mortality of the slum dwellers of Assam.

The term slum came into vogue since the 18th century. It was used to describe squalid housing in densely populated districts of industrial cities. The Oxford Dictionary defines slum, "as a street, alley court etc. situated in a crowded district of a town or city, and inhabited by the people of low income

class, or by the very poor; a number of these streets and courts forming a thickly populated neighbourhood of a squalid and wretched character".

As per 2001 census 42.6 million people of India live in slums which constitute 4% of the total population and 15% of the total urban population of India. According to the latest census 2011, slum population of India has increased and it is 65.5 million which constitute 5% of the total population and 17.4% of the total urban population of India. According to 2011 census Slum population is the highest in Maharashtra constituting 18.09% of the total slum population of India. Assam also is not free from the slums and it is 0.30% of the total slum population of India.

II. THE PRESENT STATUS OF THE SLUM DWELLERS OF ASSAM

As per census, 2011, thirty one (31) towns in Assam were reporting slums against 2613 towns reporting slums in India as a whole. According to the census of India, 2011, the slum population of Assam stands at 197,266 of which 101,424 are males and 95842 females. The slum population accounts for

0.63% of the total population and 4.5% of the total urban population of the state.

According to 2011 census the slum population is the highest in Dibrugarh i.e. 13.73% of the total slum population of Assam. In Guwahati, Silchar, Dhubri and Nagaon the percentage of slum population to the total slum population of Assam are 13.05%, 11.53%, 9.38% and 9.18% respectively.

SIGNIFICANCE OF THE STUDY

As the slum dwellers are living in a very congested and dilapidated situation due to their low income, therefore there is a great impact of socio – economic and demographic factors on their infant mortality level. The present study is an attempt to analyze the level of infant mortality and the various socio – economic and demographic factors responsible for determining the infant mortality level of the slum dwellers of Assam.

OBJECTIVE OF THE STUDY

- ✓ To study the level of infant mortality and its determinants of the slum dwellers of Assam.

III. SCOPE OF THE STUDY

Three urban centres of Assam where the slum dwellers are in highest number are selected for intensive study. These three urban centres are Dibrugarh with 27089 slum dwellers, Guwahati with 25739 slum dwellers and Silchar with 22749 slum dwellers. The proportions of slum population in the three urban centres (Dibrugarh, Guwahati and Silchar) to the total slum population of Assam as per 2011 census are 13.73%, 13.05% and 11.53% respectively. Ten percent (10%) of the slum pockets (subject to a minimum of 2) of each sample urban centre having the highest number of slum households have been taken as sample slum pockets. Hence total 26 slum pockets were selected from the three sample urban centres (22 from Guwahati, 2 from Dibrugarh and 2 from Silchar). Five percent (5%) of slum households of each sample slum pocket have been randomly selected for intensive study. Hence a total of 945 slum households were selected from 26 sample slum pockets.

IV. METHODOLOGY

The study is primarily based on primary data, however secondary data also need wherever necessary. Primary data are collected from the 945 sample slum households. Primary data are collected from the slum dwellers by administering a set of questionnaire prepared for the purpose. Secondary data are collected from the records of Municipal Corporation/Boards, publications of the department of Economics and Statistics, Govt. of Assam, census reports, websites, books, journals, newspapers etc.

INFANT MORTALITY RATE (IMR)

The infant mortality rate is especially important in the analysis of mortality because infant deaths account for a substantial number of all deaths, especially in those countries where health conditions are poor. It is generally computed as a ratio of infant deaths (deaths of children under one year of age, d_0) registered in a calendar year to the total number of live births (B) registered in the same year. This rate is computed as follows:

$$IMR = d_0/B \times K$$

$$\text{Where, } K = 1000$$

The infant mortality rate among the surveyed slum dwellers is found to be 119.57 per thousand live births in 2013 (annual average number of infants deaths being 11 and annual average number of live birth being 92) which is significantly higher than the state average of 54 for the year 2013 (Sample Registration system Statistical Report, RGI). The NFHS – 4 (2015 – 16) has found infant mortality rate for Assam as 48 per thousand live births.

V. DETERMINANTS OF INFANT MORTALITY

Infant mortality rate is very high in some societies and in others it is low, but there is no society which is free from this. In fact, the pressure of death is maximum on the infants. Different factors are responsible for infant mortality, both biological and socio – economic. The independent variables (explanatory variables) have been identified as given below.

- ✓ Ante - Natal Medical Care (ANMC)
(Using dummy variables, 1 for those who had taken ante – natal care and 0 for those who did not)
- ✓ Place of Delivery (PD)
(Using dummy variables, 1 for hospital delivery and 0 for home delivery)
- ✓ Post – Natal Non Medical Care, Breast Feeding (BF)
- ✓ Post- Natal Preventive Medical Care, Vaccination (VC)
(Using dummy variables, 1 for taking vaccination and 0 for not taking)
- ✓ Housing Condition (HC)
(Using dummy variables, 1 for good housing condition and 0 for bad housing condition)
- ✓ Mother's Education (ME)
(Using dummy variables, 1 for the illiterate and 0 for the literate mothers)
- ✓ Mother's Age at Birth (MAB)
- ✓ Birth Interval (BI)
- ✓ Type of Family (TF)
(Using dummy variables, 1 for nuclear families and 0 for joint families)
- ✓ Wife's Labour Force Participation (WLFP)
(Using dummy variables, 1 for working women and 0 for non – working women)
- ✓ Total Family Income (TFI)
- ✓ Birth Attendant (BA)

A. ANTE – NATAL MEDICAL CARE (ANMC)

Ante –natal medical care is one of the important determinants of infant mortality. Ante –natal medical care refers to pregnancy related health care provided by a doctor or a health worker in a medical station or at home. In the surveyed slum areas it is found that only 28 (30%) women have received ante – natal check-up during the last delivery. Table: 1.i shows the relation between ante- natal check-up of the mothers and infant death among the sample women.

Ante- natal check-up		No. of infant died				No. of infant deaths per 100 mothers
		0	1	Total		
Taken by the mothers	No. of babies born	26	2	28	7.14	
	No. of infant died	0	2	2		
Not taken by the mothers	No. of babies born	55	9	64	14.06	
	No. of infant died	0	9	9		
Total	No. of babies born	81	11	92	11.96	
	No. of infant died	0	11	11		

Source: Field Survey data

Table 1.i: Ante- natal medical care and number of infant deaths

Table: 1.i shows that the number of infant death per 100 women is higher (14.06) among the women who have not received ante-natal check-up than the women who have received ante-natal check-up (7.14). Thus a negative relation is observed between ante- natal check-up and infant death.

B. PLACE OF DELIVERY (PD)

Place of delivery is another important factor responsible for high infant mortality. Deliveries under unhygienic condition increases infant mortality. Ante-natal check-up and place of delivery have a positive relationship. The women who receive greater number of antenatal check-up are likely to deliver in a health centre and vice-versa.

In the surveyed slum areas, it is found that 55% deliveries are home deliveries while 45% deliveries take place in public hospitals. On the other hand, 28% deliveries were assisted by nurses, 43% by indigenous dhai, and 12% by relatives / neighbours and remaining 16% were assisted by the doctors.

Place of delivery is taken as a dummy variable in mortality determinants and place of delivery is grouped into – home delivery and hospital delivery. Table: 1.ii shows the relationship between place of delivery and number of infant deaths.

Place of delivery		No. of infant died				No. of infant deaths per 100 mothers
		0	1	Total		
Home	No. of babies	43	8	51	15.69	

delivery	born				
	No. of infant died	0	8	8	
Hospital delivery	No. of babies born	38	3	41	7.32
	No. of infant died	0	3	3	
Total	No. of babies born	81	11	92	11.96
	No. of infant died	0	11	11	

Source: Field Survey data

Table 1.ii: Place of delivery and number of infant deaths

Table: 1.ii shows that the number of infant death per 100 women is much lower (7.32) in case of hospital deliveries as compared to home deliveries among the sample slum women. Thus a strong relation between place of delivery and infant death is observed.

C. POST – NATAL NON MEDICAL CARE, BREAST FEEDING (BF)

The practice and length of breast feeding is one of the important determinants of infant mortality, which have significant effects on the mothers and their new born babies. Although breast feeding is universal in Assam, only 64.4% of children under age 3 years breast feed within 1 hour of birth as estimated by NFHS - 4 (2015-16). The immunity of the new born babies increases if they were breast feed immediate after birth.

In the surveyed slum areas infant breast feeding is found to be universal. About 47% (43) of the children were breast feed immediate after birth, 25% (23) of them were breast feed within one hour of birth while 28% (26) began it within first day of life. Table: 1.iii shows the association between starting time of breast feeding and infant death experience among the sample slum women.

Time of breast feeding		No. of infant died				No. of infant deaths per 100 mothers
		0	1	Total		
Immediate after birth	No. of babies born	40	3	43	6.98	
	No. of infant died	0	3	3		
Within one hour	No. of babies born	21	2	23	8.70	
	No. of infant died	0	2	2		
Within one day	No. of babies born	20	6	26	23.08	
	No. of infant died	0	6	6		
Total	No. of babies born	81	11	92	11.96	
	No. of infant died	0	11	11		

Source: Field Survey data

Table 1.iii: Starting time of breast feeding and number of infant deaths

Table: 1.iii shows that infant death is higher (23.08) among those babies who were breast feed within one day of birth. But infant death is lower (6.98) among the babies who breast feed immediate after birth. Thus there is a strong positive relation is observed between breast feeding and infant mortality among the sample slum women of Assam.

D. POST- NATAL PREVENTIVE MEDICAL CARE, VACCINATION (VC)

Post natal medical care against six vaccine preventable diseases is another important determinant of infant mortality. In Assam NFHS-4 (2015-16) has found that only 47.1% of the children of age 12-23 months are fully vaccinated. In the surveyed slum areas among the 92 infants born in 2013, only 15.22% (14) are found to be fully vaccinated 21.74% (20) are partly vaccinated while 63.04% (58) have not received any vaccination.

In mortality analysis vaccination is taken as a dummy variable and babies are grouped into two- (i) vaccinated and (ii) not vaccinated. Table: 1.iv shows the relationship between vaccination given to the infants and number of infant deaths.

Status of vaccination given to babies		No. of infant died			
		0	1	Total	No. of infant deaths per 100 mothers
Given	No. of babies born	31	3	34	8.8
	No. of infant died	0	3	3	
Not given	No. of babies born	50	8	58	13.8
	No. of infant died	0	8	8	
Total	No. of babies born	81	11	92	11.96
	No. of infant died	0	11	11	

Source: Field Survey data

Table 1.iv: Vaccination given to the infants and number of infant deaths

Table: 1, iv shows that the number of infant deaths per 100 babies is higher (13.8) among those who had not vaccinated. Thus a negative relationship between immunization of the infants and infant mortality is observed.

E. HOUSING CONDITION (HC)

Housing condition is another important determinant of infant mortality. The condition of the house, the materials used for its construction, availability of light, drinking water facility, drainage system, sanitation facility etc. are important factors which determine infant mortality to a great extent.

The housing condition of the sample slum areas is far from satisfactory. It is found that 88.1% (833) families live in kutchha houses (made of mud, thatch, plastic and bamboo), 3.3% (31) in semi pucca houses and only 8.6% (81) families live in pucca houses.

Housing condition is a qualitative variable and in the study of mortality, it is taken as a dummy variable. It is also found that the pucca and semi pucca houses in the sample

slum areas have minimum basic amenities of life as compared to the kutchha houses. So, the housing condition of the pucca and semi pucca houses are assumed as good housing condition and the kutchha houses are taken as bad housing condition. Table: 1.v shows the relationship between housing condition of the sample population and number of infant death.

Condition of house where babies were born		No. of infant died			No. of infant deaths per 100 mothers
		0	1	Total	
Good condition	No. of babies born	10	1	11	9.09
	No. of infant died	0	1	1	
Bad condition	No. of babies born	71	10	81	12.35
	No. of infant died	0	10	10	
Total	No. of babies born	81	11	92	11.96
	No. of infant died	0	11	11	

Source: Field Survey data

Table 1.v: Housing condition of the sample population and number of infant deaths

It reveals from the table that the number of infant death per 100 houses is higher (12.35) in bad condition houses while it is lower (9.09) in good condition houses. Thus a negative relation is observed between housing condition and infant mortality among the sample slum dwellers of Assam.

F. MOTHER'S EDUCATION (ME)

Among the different determinants of infant mortality, mother's education is regarded to be the most important. Educated mother's are more conscious about the health of their children, nutrition and hygiene and may adopt appropriate steps for recovering diseases.

The association between educational attainment of the mothers and infant death is shown in table: 1.vi.

Educational attainment of mothers		No. of infant died			No. of infant deaths per 100 mothers
		0	1	Total	
Illiterate	No. of babies born	41	6	47	12.77
	No. of infant died	0	6	6	
Literate	No. of babies born	40	5	45	11.11
	No. of infant died	0	5	5	
Total	No. of babies born	81	11	92	11.96
	No. of infant died	0	11	11	

Source: Field Survey data

Table: 1.vi: Mother's education and number of infant deaths

It is seen from the table that the number of deaths per 100 babies is higher among the illiterate mothers (12.77) than those of the literate mothers (11.11). Thus a negative relation

is observed between educational attainment of the mothers and infant death.

G. MOTHER’S AGE AT BIRTH (MAB)

Mother’s age at birth is one of the important demographic factors which influence infant mortality. Children of the youngest and oldest mothers experiencing higher mortality than those children whose mothers are in their prime reproductive age. The mean age at marriage of the sample respondents is found to be 19 years. The relationship between age at birth of the mothers and infant mortality experience is shown in table: 1.vii.

Age of the mothers when the babies were born		No. of infant died			No. of infant deaths per 100 mothers
		0	1		
Upto– 20 years	No. of babies born	19	3	22	13.64
	No. of infant died	0	3	3	
21 - 25	No. of babies born	30	6	36	16.67
	No. of infant died	0	6	6	
25+	No. of babies born	32	2	34	5.88
	No. of infant died	0	2	2	
Total	No. of babies born	81	11	92	11.96
	No. of infant died	0	11	11	

Source: Field Survey data

Table 1.vii: Mother’s age at birth and the number of infant deaths

Table: 1.vii shows that mothers whose age at birth is more than 25 years have experienced lowest number of infant death (5.88) than those of the others. But it is relatively stable in other age groups. So no significant relationship is emerged.

H. BIRTH INTERVAL (BI)

Birth interval is a powerful variable influencing the survival chances of the infants. Short birth interval may adversely affects mothers health and their infants chance of survival. Table: 1.viii shows the association between births interval and the number of infant deaths.

Births interval (in months)		No. of infant died			No. of infant deaths per 100 mothers
		0	1	Total	
Upto - 18	No. of babies born	53	8	61	13.11
	No. of infant died	0	8	8	
19 - 24	No. of babies born	20	2	22	9.09
	No. of infant died	0	2	2	
25 and	No. of babies born	8	1	9	11.11

above	No. of infant died	0	1	1	
Total	No. of babies born	81	11	92	11.96
	No. of infant died	0	11	11	

Source: Field Survey data

Table 1.viii: Births interval and number of infant deaths

It reveals from the table that mortality is the highest (13.11) per 100 infants who were born with the interval of 18 months. But it is relatively stable in other birth interval groups. So, no significant relationship has emerged.

I. TYPE OF FAMILY (TF)

It is generally thought that in joint families, children are not taken care of which results into high mortality. S. Goswami has found high mortality in joint families among the tea garden labours of Assam. Rupjyoti has also found significant relationship between infant mortality and family type among the Adis of Arunachal Pradesh.

In the sample slum areas 78.2% (739) of the families are found to be nuclear while 21.8% (206) belong to joint families. The association between family type and infant death experience is shown in table: 1.ix.

Type of families where the babies were born		No. of infant died			No. of infant deaths per 100 mothers
		0	1	Total	
Nuclear	No. of babies born	52	7	59	11.86
	No. of infant died	0	7	7	
Joint	No. of babies born	29	4	33	12.12
	No. of infant died	0	4	4	
Total	No. of babies born	81	11	92	11.96
	No. of infant died	0	11	11	

Source: Field Survey data

Table 1.ix: Family type and number of infant deaths

It is found from the table that the mothers living in the joint families have experienced higher infant deaths (12.12) than those of the nuclear families (11.86).

J. WIFE’S LABOUR FORCE PARTICIPATION (WLFP)

Work force participation among the sample women is very poor. Only 25.8% (244) of the mothers are engaged in different activities while 74.2% (701) are simple housewives. The relationship between infant mortality experience and working status of the sample mothers is shown in table: 1.x.

Working status of the wives		No. of infant died			No. of infant deaths per 100 mothers
		0	1	Total	
Working	No. of babies born	19	2	21	9.52
	No. of infant died	0	2	2	
Non - working	No. of babies born	62	9	71	12.68

	No. of infant died	0	9	9	
Total	No. of babies born	81	11	92	11.96
	No. of infant died	0	11	11	

Source: Field Survey data

Table 1.x: Wife's labour force participation and number of infant deaths

Table shows that the number of death per 100 working women is lower (9.52) than those of the non working women (12.68). The non working women generally belong to low income families, illiterate and unaware about the health care measures of the infants. So, infant death among them increases.

K. TOTAL FAMILY INCOME (TFI)

The relationship between family income and infant death experience among the sample families is shown in table: 1.xi.

No. of families having annual income (in Rs.)		No. of infant died			No. of infant deaths per 100 mothers
		0	1	Total	
Upto 60,000	No. of babies born	47	8	55	14.55
	No. of infant died	0	8	8	
60,001-120,000	No. of babies born	25	3	28	10.71
	No. of infant died	0	3	3	
120,001-180,000	No. of babies born	6	0	6	0
	No. of infant died	0	0	0	
180,001 and above	No. of babies born	3	0	3	0
	No. of infant died	0	0	0	
Total	No. of babies born	81	11	92	11.96
	No. of infant died	0	11	11	

Source: Field Survey data

Table 1.xi: Total family income (annually) and number of infant deaths

Table: 1.xi shows that infant mortality experience among the families belong the income categories of Rs. 60,000 (annually) is the highest (14.55) and the families with annual income Rs. 60,001 and more upto Rs. 120,000 is the lowest (10.71). While no infant death is found among the families whose incomes are 120,001 and above. So no significant relationship is observed between total family income (annually) and number of infant death.

L. BIRTH ATTENDANT (BA)

Birth attendant is an important determinant of infant mortality. The relationship between birth attendant and number of infant death among the sample slum dwellers is shown in table: 1.xii.

Birth attended by		No. of infant died			
		0	1	Total	No. of infant deaths per 100 mothers
Doctor	No. of babies born	14	1	15	6.67
	No. of infant died	0	1	1	
Nurse	No. of babies born	24	2	26	7.69
	No. of infant died	0	2	2	
Indigenous dhai	No. of babies born	33	7	40	17.5
	No. of infant died	0	7	7	
Relatives/ neighbours	No. of babies born	10	1	11	9.09
	No. of infant died	0	1	1	
Total	No. of babies born	81	11	92	11.96
	No. of infant died	0	11	11	

Source: Field Survey data

Table 1.xii: Birth attendant and the number of infant deaths

It reveals from the table that the number of infant death per 100 babies is higher among those who were attended by indigenous dhai (17.5) at the time of birth. While it is lower when the babies were attended by doctors (6.67) or nurses (7.69). Thus a negative relation is observed between birth attendant and infant death.

From the above observation, it is found that there is some kind of association (positive and negative) between the 12 independent variables and the infant mortality among the sample slum dwellers of Assam. But, in order to observe the long run impact of the independent variables and the level of significance of such impact on the dependent variable (IM), Binomial Logit Regression analysis has been applied.

VI. BINOMIAL LOGIT REGRESSION ANALYSIS

The binomial model applied here can be written as:

$$IM_i = \ln(P_i/1-P_i) = \beta_0 + \beta_1ANMC_i + \beta_2PD_i + \beta_3BF_i + \beta_4VC_i + \beta_5HC_i + \beta_6ME_i + \beta_7MAB_i + \beta_8BI_i + \beta_9TF_i + \beta_{10}WLPF_i + \beta_{11}TFI_i + \beta_{12}BA_i + U_i$$

Where,

P is the predicted probability of infant mortality (IM) which is coded as 1 and 1-P is the predicted probability of survival of infant which is coded as 0.

β_0 is the intercept term which gives the mean or average value of IM, when all the independent variables are set equal to zero.

$\beta_1, \beta_2, \dots, \beta_{12}$ are regression co-efficient for each of the explanatory variables, U_i is the stochastic error term.

VII. FINDINGS OF THE REGRESSION ANALYSIS

Results summarizing the effects of all the twelve variables on infant mortality have been presented in table: 2.

Dependent variable: Infant Mortality

Regressor	Coefficient (β)	Wald	Exp. (β)
ANMC	-.255	.184	.775
PD	-4.689	11.466 *	.009
BF	.989	30.018 *	2.688
VC	2.827	5.615	16.887
HC	.194	.079	1.214
ME	-.126	.150	.882
MAB	-.074	1.935	.928
BI	-.141	.496	.868
TF	.111	.099	1.117
WLFP	-.097	.058	.908
TFI	.000	.432	1.000
BA	-.283	.598	.753
Constant	.471	.090	1.601

Cox & Snell $R^2 = 0.112$, Nagelkerke $R^2 = 0.212$

Hosmer and Lemeshow goodness of fit test statistic = 9.506

Convergence achieved after five iterations.

*Significant at 1% level.

Table 2: Determinants of infant mortality: Binomial Logit Regression Results

Estimated results of the logistic regression model (table:2) show that out of the 12 influencing variables included in the model, only 2 variables such as place of delivery (PD) and breast feeding (BF) are found to be significant factors determining variations in infant mortality among the sample slum population.

Place of delivery (PD) is found to have negative significant association with infant deaths. It is being found that hospital delivery decreases the risk of infant deaths by 4.689 units than home delivery.

So far as the relationship of breast feeding (BF) on infant mortality is concerned, it can be seen that it is a significant variable. The β coefficient for breast feeding being 0.989 reveals that increasing the starting time of breast feeding increases the risk of infant mortality by 0.989 units.

On the contrary, other variables such as ante-natal medical care (ANMC), vaccination (VC), housing condition (HC), mother's education (ME), mother's age at child birth (MAB), birth interval (BI), type of family (TF), wife's labour force participation (WLFP), total family income (TFI) and birth attendant (BA) are not found to be significant factors determining the variation in infant mortality among the sample slum dwellers of Assam.

VIII. CONCLUSION

From the observation, it is found that infant mortality rate of the sample slum dwellers of Assam is higher than those of the state average i.e. the infant mortality of the slum dwellers is found to be higher than the state average. For the reduction of the number of infant mortality among the slum dwellers, the government must provide basic amenities of life like medical facilities, electricity, pure drinking water, drainage facility; sanitary latrines etc. to them, so that they can live in a clean environment and secure their financial condition by providing them permanent source of earning.

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