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SOCIOECONOMIC DETERMINANTS OF MATERNAL ANEMIA: A DISAGGREGATED LEVEL ANALYSIS FROM ASSAM, INDIA

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Abstract: This study examines socio-economic determinants associated with maternal mortality at disaggregated level in Assam, the state with highest maternal mortality ratio in India. An extensive door-to-door household survey was carried out during 2014-15 using multistage sampling to select villages in districts with high number of reported maternal deaths. The samples consist of currently pregnant women, mother with children 0-24 months and members of families who have experienced of maternal death. The study reveals that prevailing incidences of maternal mortality and maternal complications are the result of maternal anemia. Maternal complications are more likely to be associated with lower concentration of hemoglobin level, which is a proxy for maternal anemia. In addition, concentration of hemoglobin level is positively related to socioeconomic factors-literacy, land ownershipand habitat/occupation of the sample population. As a policy prescription, such findings should encourage the policymakers to identify context specific determinants of maternal anemia for appropriate interventions, instead of 'one-size-fits-all' type of approach.

Keywords: Maternal Anemia, Social Context,Dietary Supplementary, Iron Bioavailability.

Introduction

During pregnancy, women are at high risk of anemia since requirement for iron increases due to expansionof red cells and development of the foetus/placenta (Hazra and Maitra, 2001; Nair and Iyengar, 2009). According to World Health Organization (WHO), anemia is a state which exists when concentration of hemoglobin level below 11 g/dL in pregnant women, whereas, hemoglobin level below 7 g/dL is considered as severe anemia (Sharma & Shankar, 2010; Gogoi & Prusty, 2013).Lower hemoglobin level is associated with birth complications such as increases the risk of postpartum hemorrhage, preeclampsia and preterm birth, stillbirth including death of mother and her infant (Ali *et al.*, 2011; Laflamme, 2011; Frass, 2015).

Although incidences of malaria, helminth and chronic infections play a major role in development of anemia, iron deficiency is the most common form of anemia(Singh, 2012).An estimate of WHO states that iron deficiency is responsible for 50 percent of all anemia cases (WHO, 2015). An intervention to reduce anemia induced by iron deficiency in pregnant women is distribution of iron supplementation. However, policymakers should consider the context specific determinants and sociocultural influences on the implementation of such programme (Nagata *et al.*, 2012).

WHO (2015) showed that India contributes one-third of all global maternal deaths (15 percent). Kalaivani, (2009) argued that anemia is directly and indirectly responsible for 40 percent of maternal deaths in India. At the state level, Assam has highest maternal death with 300 per 1, 00,000 live births (SRS, GOI, 2013). According to National Family Health Survey (2015-16), 46 percent of all women aged between 15-49 years are anemic in Assam (vs. at national average is 53 percent).

Previous studies from Assam highlighted that anemia is largely associated with vulnerable group of women (such as illiterate, lives in rural areas) due to lack of proper care and nutritional deficiency (Gogoi, 2011; Sharma *et al.,* 2012).Medhi *et al.,* (2006) and Das *et al.,* (2012)have shown that a high prevalence of undernutrition and anemia among laborers of tea community of Assam.[1]Recent studies done by Malakar and Malakar (2014), Bora *et al.,* (2015) and Gogoi *et al.,* (2016) have focused on prevalence of anemia based on socio-demographic factors and hospital based sample units. They suggested that community level awareness regarding nutrition and iron supplementation, monitoring of IFA supplementation and educational qualification can reduce the incidence of anemia.

Yet, to the best of our knowledge, little attention has been given to identification of prevalence of anemia in Assam at community level. The purpose of the present paper attempts to address the socioeconomic determinants of lower concentration of hemoglobin level (as a proxy of anemia) at community level. Given the non-availability of secondary data, we collected data through door-to-door household level survey with a structured questionnaire. Our finding shows that maternal complications in our sample are significantly associated with maternal anemia (reinforcing the conventional medical wisdom). To mitigate the adverse effects of low hemoglobin, we then discuss the role of iron bioavailability (in contrast with government mandated and freely distributed Iron and Folic Acid tablets) on concentration of lower hemoglobin level. Our analysis shows that concentration of hemoglobin level is positively related to socioeconomic variables such as literacy, land ownership and non-habitat of teagarden population. However, evidence in favor of literacy rate (in terms of statistical significance level) is a bit weak.

Thus, our study complements to the existing literature (on Assam) by evaluating the socioeconomic determinants of lower concentration of hemoglobin level at community level. Secondly, the present analysis identifies that socioeconomic factors like literacy, land ownership, habitat/occupation are likely to be key determinants of maternal anemia. Third, we stress on the role of iron bioavailability as a mitigating factor.

Methodology

The main objective of the paper is to explore the socioeconomic determinants of lower concentration of hemoglobin level (as a proxy of anemia) at community level. A multistage sampling design was used in the present study. At first, districts under each Administrative Divisions of Assam2were arranged according to the reported MMR for the year 2013-14. This helped us to identify four districts with highest MMR. Further, from each sample districts we have selected four Block Primary Health Center (BPHC)which had reported highest maternal death. Finally, as per block medical officers, we have selected two villages from each BPHC (total 8 villages). The details are in Table 1.[3]

By using snowball sampling, we interviewed the following from each sample village

- Currently pregnant women.
- Mothers who have children aged 0-24 months.

[1]Tea tribe population originally brought from neighbouring states of the present day Orissa, Madhya Pradesh, Bihar, Andhra Pradesh and West Bengal into Assam by British colonial planters about 150 years ago for engaging in teagardens as laborers and subsequently settled in Assam permanently. They are recognized as Other Backward Classes (OBC) by the Government (GOA; Das, 2016).

[2]Assam has four administrative divisions:

Upper Assam Division includes- Tinsukia, Dibrugarh, Sibsagar, Jorhat, Golaghat,
Lower Assam Division includes-Kokrajhar, Dhubri, Goalpara, Darrang, Bongaigaon, Barpeta, Kamrup, Nalbari
North Assam Division includes-Marigaon, Nagaon, Sonitpur, Lakhimpur, Dhemaji
Hills and Barak Valley Divisions includes-KarbiAnglong, North Cachar Hills, Cachar, Karimganj, Hailakandi
Source: Annual Health Survey (AHS) 2010-11

[3]Note that maternal death is a comparatively rare event. Therefore, data was collected from those blocks (a district comprises of several blocks) where reported maternal death was highest. Even so, we have found cases where no maternal complications arose, thus providing us with the necessary counterfactual.

- Members of a family which has experienced of maternal deaths.

Since, we follow the purposive sampling methods; we interviewed 169 subjects with reference to availability of sample unit during the period of the survey. The survey period was September 2014 to February 2015 with the reference period of 365 days preceding the date of the survey. The objective of the questionnaire was to obtain information on maternal health status and maternal deaths cases; socio-demographic characteristics of subjects; reproductive history as well as various aspects of anemia and consumption expenditure.

Data Summary

Maternal Health Outcome

Table 2 presents maternal death cases, high risk pregnancy, complication during pregnancy and normal pregnancy.

Socio-demographic Profile

Table 3 provides the detailed profile of the socio-economic and demographic characteristics of the respondents.

Maternal Death Cases

Table 4 shows the maternal death profile of the studied villages.

Results

From the field observation, it is noticed that in our sample, 91 percent of women are anemic. Further, out of 169 sample respondents, 33 percent of women had faced complication during their pregnancy and out of that, 87 percent of women are anemic. Further, Table 5 shows that concentration of lower hemoglobin level (Hb below 11 g/dL) is significantly associated with maternal complications (χ^2 = 9.09, p = 0.003). Field observations also reflects that prevalence of anemia is significantly high among Tea tribe population (χ^2 = 22.29, p= 0.000). Similarly, caste-wise prevalence of anemia reveals that anemia is highly associated with Other Backward Class(OBC) and Scheduled Caste (SC) population (χ^2 = 17.21, p= 0.001) (Table 6). The result conforms to the existing medical wisdom.

Socio–Economic Causes of Maternal Anemia in the Studied Areas:

In many cases, anemia during pregnancy develops due to low socio-economic status, customs and dietary habits. The incidences of anemia among pregnant women vary according to their societal backgrounds, lifestyles and health seeking behaviors across different cultures (Lone, Qureshi, & Emmanuel, 2004). Studies by Ensor & Cooper (2004), Singh *et al.*, (2009), Goodman & Currie (2010), Nwizu*et al.*,(2011),Mahashabde*et al.*, 2014have shown that prevalence of anemiaduring pregnancy is largely associated with maternal age, level of literacy, income level, socio-economic status, cultural belief, disadvantaged groups and utilization of health care services.

Based on this literature, variables such as literacy, income, age of marriage, food expenditure, land ownership, use of family planning methods and birth order are considered as the factors affecting the level of hemoglobin. The definition of the explanatory variables and expected signs of the coefficients of the variables are presented in Table 7.Summary statistics of all variables are presented in Table 8.

The functional relationship between the dependent and the independent variables (Model 1) is

$$lnHb_i = \alpha + \beta_0 Lit_i + \beta_1 lnAoM_i + +\beta_2 LO_i + \beta_3 BO_i + \beta_4 UFP_i + \mu_i \quad \ldots\ldots 1$$

Where,

α= Constant

β_i= Vector of Coefficients

lnHb= Natural Log of Hemoglobin Level

Lit= Literacy Level

lnAoM= Natural Log of Age of Marriage

LO=Land Ownership (Acres)

BO= Birth Order

UFP= Use of Family Planning

μ= Error term

Employing the Variance Inflation Factor (VIF), we found no collinearity problem in the present model. Further, the Breusch-Pagan test / Cook-Weisberg test and Cameron & Trivedi's decomposition have been carried out to detect heteroscedasticity in the data set. There is no evidence of heteroscedasticity problem among the variables (χ^2=7.55, p=0.37). Additionally, logarithmic transformations of the dependent variable and the independent variables are done to normalize their variations. Robust standard error has been applied to obtain an accurate p-value of the predictor variables.

In order to check the robustness of the base model, in subsequent models we added control variables such as per capita food expenditure (PCFdEx) in Model 2; per capita income (PCI)[4] in Model 3 and finally we have added Tea Garden dummy (DTGpop) (i.e. whether the respondentis a teagarden laborer or not) after controlling PCFdEx and PCI. Accordingly, the remaining three models are:

$$lnHb_i = \alpha + \beta_0 Lit_i + \beta_1 lnAoM_i + \beta_2 LO_i + \beta_3 BO_i + \beta_4 UFP_i + \beta_5 lnPCFdEx_i + \mu_i \quad \ldots\ldots 2$$

$$lnHb_i = \alpha + \beta_0 Lit_i + \beta_1 lnAoM_i + \beta_2 LO_i + \beta_3 BO_i + \beta_4 UFP_i + \beta_5 lnPCFdEx_i + \beta_6 lnPCI_i + \mu_i$$

…… 3

$$lnHb_i = \alpha + \beta_0 Lit_i + \beta_1 lnAoM_i + \beta_2 LO_i + \beta_3 BO_i + \beta_4 UFP_i + \beta_5 lnPCFdEx_i + \beta_6 lnPCI_i + \beta_7 DTGpop_i + \mu_i$$

…… 4

[4]The yearly income is calculated from monthly earning of a member in a household from his/her principal occupation

Table 9 provides the result of OLS regression models, p values and their associated AIC scores. Model shows concentration of hemoglobin level is positively related with literacy(significance level 10%)and land ownership (a proxy of wealth) (significance level 1 %). The coefficient of literacy shows that compared to respondents with no literacy, the concentration of haemoglobin level is 7% higher among literates. At the same time, compared to households with no land ownership, the concentration of hemoglobin level is5 % higher among households with land ownership.

The coefficient of land ownership and literacy are positive and statistically significant throughout. Further, after controlling per capita food expenditure and per capita income, Tea Garden dummy is negatively and significantly (at 5 % significance level) associated with concentration of hemoglobin level. It shows that the respondents who do not live in teagarden areas, the level of haemoglobin level is9 % higher than the respondents who live in teagarden areas. However, the coefficient of food expenditure per capita is negative and statistically significant (albeit at a weaker 10 % significance level).

Although Model 1 has the lowest AICscore (60.41),we choose Model 4 (60.74) as the AIC score is close enough. Moreover, it is also theoretically consistent.

Discussion

The finding of the present study provides that literacy is more or less positively associated with hemoglobin level. However, evidence in favor of literacy rate (significance level) is a bit weak. This result is consistent with findings of Bisoi *et al.*, (2011), Chowdhury *et al.*, (2015), Balasubramanian *et al.*, (2016), Mangla & Singla, (2016).

The coefficient of land ownership has a significant impact on level of hemoglobin concentration. This is consistent with the study of Haverkate *et al.*, (2014). They have considered land ownership as one of the measures of wealth. They found that higher socioeconomic classes had higher mean of hemoglobin (Hb) level. Moreover, a household with land of their own has the opportunity to engage in economic activities such as agricultural works, home garden, livestock and poultry farm of their own. An adequate amount of micronutrient food intake is necessary to ensure nutritional adequacy. Even the low-income households with land ownership can be able to maintain their nutritional diet from their home-grown food product. On the other hand, those who have no access to land of their own have to rely on the market for their daily diet. Therefore, land ownership is one of the important factors to a household for self-sustained food product and income as well to maintenance of hemoglobin level in the long run.

We also found that tea garden population, for whom occupation and habitat uniquely marge, are more likely to suffer from anemia. This is consistent with Gogoi (2011), Das *et al.*, (2012) and Sharma *et al.*, (2012).

Iron Bioavailability: Notes from the Field

Here, we supplement our statistical analysis with discuss the role of iron bioavailability as a mitigating factor. Although distribution of iron supplementation (IFA tablets) is practiced as an alternative to dietary intervention, it may not be too helpful in preventing anemia without an optimum diet maintained by the women of reproductive age group. As per the recommendation of WHO (DeMaeyer, 1989), amount of iron absorption is influenced by the combination of foods taken in a given meal. Studies by Galloway and McGuire(1994),Hallberg *et al.*, (1966), Beard (2000),Mithra *et al.*, (2013) have argued that common reasons for not consuming IFA tablets are side effects, lack of access, misunderstood instructions etc. Consumption of IFA tablets is mostly influenced by age, socioeconomic status, community awareness regarding importance of IFA tablets. A study of Patterson *et al.*, (2001) have suggested that a diet rich in iron appears to be more advantageous over iron supplementations as it is cost-effective and shows higher efficacy and benefits in the

long-term. Dietary iron absorption depends on bioavailability of iron i.e. amount of heme and non-heme iron in the meal.[5]Iron nutritional status depends on absorption of iron in the body that is determined by an adequate amount of iron in dietary composition or through the iron supplementation. A balanced diet of heme and non-heme can enhance the iron absorption to maintain hemoglobin level and to reduce the incidence of anemia (DeMaeyer, 1989; Sharma & Shankar, 2010).

Observation from field visit shows that proper diet is not maintained, particularly among the tea laborers. For instance, Table 10 provides that the per capita food expenditure on heme food product is high in Muhimari, Patgaon, Janzimukh and Kadamoni as compared to rest of the sample villages.[6]

It is clear from the Table 10 that in teagarden areas (such as Lepetkatta Tea Estate, Shakumato Tea Estate, Motinagar, Silcoori Tea Estate), the expenditure on heme product is low in daily diet. This is confined to staple foods (cereals) with low iron bioavailability. The population in teagarden areas have less access to diversified diet due to land and geographical bottlenecks. Respondents from teagarden areas live in either in quarters provided by management or temporary hut inside teagarden and they do not possess land of their own. This attributes to lack of home-grown food products. Report of Global Network for the Right to Food and Nutrition 2016, also reveals that given the lack of alternative means of livelihoods, teagarden workers are highly dependent on food rations provided by the Tea Company which is often insufficient, inadequate and of bad quality. The report also mentions that it is not affordable for the workers with their wage to have an adequate amount of food or any additional food to maintain a diversified diet. Evidence from the field survey shows that most of the teagarden workers have no ration card as the casual workers (74.42 percent) are discriminated against in accessing ration card and other facilities like hospitals, housing and other amenities. They solely depend on daily market for their food. On the other hand, people of Janzimukh, Patgaon, Kadamoni, Muhimari have diversified food availability at their own land as they live in a geographically better position along with the available water resources and access to land of their own which help them go for diversified food consumption. Home-grown foods and green leafy vegetables, fish and poultry farms of their own house help to maintain proper food habits. Table 11shows the distribution of households according to their land ownership. Households with no land holdings are from tea garden areas and rest are from non-teagarden habitat.

Conclusion and Implications

In sum, our result shows that socioeconomic determinants such as landownership and occupation/ habitat are important for better hemoglobin prospects. People who have their own land or live in areas where bioavailability of heme products (fish, meat) are high enough due to immediate geography, fare better in terms of maternal health. Micronutrient food-based approach can be taken as preventive strategies of nutritional deficiency and malnutrition. Promoting home gardens, small scale animal husbandry to maintain regional and local variation of diet, ensuring seasonal availability in the iron containing foods are vital to enhance the bioavailability (Biswas and Baruah, 2014). Findings also reveal that prevalence of anemia is high among social groups such OBC and SC population. Similarly, concentration of hemoglobin level also found significantly associated with teagarden population compared to non-teagarden population. Further, given our previous discussion, these results imply dietary inclusion of iron is to be more important than distribution of IFA tablets.As a policy prescription, one has to rethink the idea of distribution of IFA tablets: probably direct distribution of heme products in a form which is acceptable to the population will matter. Protection of wages

[5]Heme product (animal sources of iron products), non-heme products: plant sources of iron such as grains, cereals, vegetables and nuts) (MacDonald et al., 2007).

[6]The monthly food expenditure of a household is calculated by estimating the rupees spent on food items like heme (meat and fish) and non-heme (cereals- rice, dal, and veg) product and others (oil, salt, and sugar) based on 1 week recall period.

of tea garden laborers and enactment of better working conditions will also increase their economic position (so that dependence on cereal based food goes down). This can also be thought of as a policy.

Appendix

Table 1: Selected Districts and BPHC of Four Administrative Divisions of Assam Based on Highest Maternal Mortality Ratio Reported in the Period of 2013-14

District	Maternal Mortality Ratio in Districts	Name of BPHC	Maternal Death at BPHC	Name of Village
Kamrup	230.1539	Chhaygaon	7	Muhimari, Patgaon
Dibrugarh	413.3103	Barbaruah	86	Janzimukh, Lepetkatta TE
Sonitpur	297.3435	BiswanathChariali	14	Kadamani, Sakumato TE
Cachar	516.6315	Sonai	10	Motinagar, Silcoorie TE

Table 2: Maternal Health Outcome at Study Villages

Maternal Outcome	No.	(%)
Maternal Deaths	17	10.05
High Risk Pregnancy	29	17.16
Complications	27	15.98
Normal Pregnancy	96	56.8
Total Pregnancy	169	100

Sources: Field data 2014-15

Table 3: Percentage Distribution of the Respondents by Selected Socio-Economic Variables

Socio-economic Variables	No.	%
Age at Marriage		
>18	28	16.57
19-29	121	71.6
Above 30	20	11.83
Literacy		
Illiterate	88	52.07
Literate	61	36.09
Only sign	20	11.83
Birth Order		
1	66	39.05
2 to 3	76	44.97
4 to 5	22	13.01

6 to 7	5	2.96
Anemia		
>12	14	8.28
All anemia	155	91.72
Mild anemia	19	12.26
Moderate anemia	82	52.90
Severe anemia	29	18.17
ANC Coverage (N=91)		
One	2	2.08
Three	34	35.42
Four	55	57.29
Use of Contraceptive	20	11.83
Family Size Structure		
Nuclear Family	101	59.76
Joint Family	68	40.24
Housing Condition		
Kutcha	139	82.25
Pucca	20	11.83
Semi-Pucca	10	5.92
Drinking Water Facilities		
Pump tube well	92	54.44
Well	38	22.49
Supply water	30	17.75
Stream water	9	5.33

Sources: Field data 2014-15

Table4: Profile of Maternal Death Cases at Studied Villages

Cases	Age	Education Level	Weight	Birth Parity	Hb Level	Maternal History	When did Death Occur	Causes of Deaths
Case 1 (Muhimari)	19	9	41	1	9.3	0	Postpartum	Anemia and Severe Weakness
Case 2 (Muhimari)	35	3	40	4	11.4	High BP	Postpartum	Pre-Eclampsia
Case 3 (Patgaon)	35	0	40	7	6.1	0	Postpartum	Anemia
Case 4 (Lepetkatta TE)	35	0	48	5	8.1	0	Postpartum	Anemia and Weakness
Case 5 (Lepetkatta TE)	38	0	40	7	7	Nerve Problem	Postpartum	Anemia
Case 6 (Lepetkatta TE)	25	0	47	2	8.6	0	Postpartum	Pre-Eclampsia and Anemia
Case 7 (Kadamoni)	26	0	48	2	11.4	Still birth	Postpartum	Postpartum Alcoholism
Case 8 (Kadamoni)	26	0	49	5	8.2	Miscarriage	Postpartum	Postpartum Haemorrhage
Case 9 (Kadamoni)	28	0	45	3	12	Miscarriage	During Pregnancy	Miscarriage and Sever Abdominal Pain
Case 10 (Sakumato TE)	24	0	37	4	8	Anemic	During Delivery	Haemorrhage
Case 11 (Sakumato TE)	25	0	39	1	9.2	0	During Pregnancy	Severe anemia
Case 12 (Sakumato TE)	23	0	42	3	7	Anemic	During Pregnancy	Severe anemia
Case 13 (Motinagar)	39	0	49	6	3	Still birth	Postpartum	Anemia and Pre-Eclampsia
Case 14 (Motinagar)	32	0	36	3	8	Anemic	Postpartum	Edema
Case 15 (Motinagar)	33	0	48	6	10	0	During Pregnancy	Antepartum Haemorrhage
Case 16 (Silcoorie TE)	25	4	44	3	7	0	Postpartum	Respiratory problem
Case 17 (Silcoorie TE)	28	5	41	3	8	0	Postpartum	Cardiomyopathy

Source: Field Survry 2014-15

Table5: Concentration of Hemoglobin level with Maternal Complications Among Women in Studied Villages (Obs.=169)

	No Pregnancy Complications (n=119)	With Pregnancy Complications (n=50)	Chi Square Test
Hb level above 11 g/dL	35 (29%)	4 (8%)	χ^2= 9.0929
Hb level below 11 g/dL	84 (71%)	46 (92%)	p= 0.003

Source: Survey data 2014-15

Table 6: Prevalence of Anemia based on Population Characteristics and Caste Dummies in Studied Villages (N=169)

	No Anemia (Hb>12)	With Anemia (Hb<11)	Chi Square Test
Non-Tea Garden Population	33 (38%)	6 (7%)	χ^2= 22.29
Tea Garden Population	54 (62%)	76 (93%)	p= 0.000
Caste Dummies			
General	14 (30%)	32 (72%)	
OBC	9 (15%)	52 (85%)	χ^2= 17.21
SC	1 (4%)	26 (96%)	p= 0.001
ST	15 (43%)	20 (57%)	

Source: Survey data 2014-15

Table 7: Definition of the Explanatory Variables and their Expected Impact on Better Concentration of HeboglobinLevel

Variables	Definition	Expected sign
Lit	Literacy (1= if respondent is literate; 0= otherwise)	+
PCI	Per capita income (on yearly basis)	+
PCFdEx	Per capita food expenditure (monthly food expenditure in rupees)	+
AoM	Age of Marriage (years)	+
LO	Land Ownership (area inacres)	+
UFP	Use of family planning methods (1= if respondents use any family planning methods; 0= otherwise)	+
BO	Birth Order (1= if birth order is not more than 2-3; 0= otherwise)	+
DTGgroups	Dummy Tea-Garden Population (1= if respondents live in tea garden areas; 0= otherwise)	+/-

Table 8: Descriptive Statistics of the Variables Influencing in Concentration of Hemoglobin level

Variables	Mean	Std.Dev.	Min	Max
Lit	0.390533	0.48932	0	1
PCI	9945.32	6158.334	2000	36250
PCFdEx	7063.32	2713.541	2790	21060
AoM	18	3.278719	12	28
LO	0.614615	1.091507	0	5.61
UFP	0.118343	0.323974	0	1
BO	0.35503	0.479944	0	1
DTGpop	.4852071	.5012664	0	1

Source: Survey data 2014-15

Table 9: Hemoglobin Level with Associate Variables Based on Primary Data

Variables	Dependent Variable (Hemoglobin Level)							
	Model 1		Model 2		Model 3		Model 4	
	Coefficient	t	Coefficient	t	Coefficient	t	Coefficient	t
Lit	.079886*	1.72	.0808792*	1.75	.0835586*	1.79	.067095	1.46
	(.0463135)		(.0462493)		(.0467139)		(.0458967)	
lnAoM	.1824529	1.46	.1850926	1.49	.1715918	1.36	.1464689	1.17
	(.1246365)		(.1240561)		(.1260556)		(.1246934)	
LO	.059295***	3.24	.0574258***	3.09	.0584949***	3.13	.059959***	3.37
	(.0183202)		(.0185623)		(.0187076)		(.0178045)	
BO	.0109568	0.24	.0126023	0.28	.0114584	0.26	-.0092022	-0.20
	(.044955)		(.0446955)		(.0447645)		(.0468862)	
UFP	-.036568	-0.58	-.0403766	-0.63	-.0455272	-0.71	-.0457748	-0.73
	(.0627803)		(.0637)		(.06391)		(.0628172)	
PCFdEx	-	-	-.0526487	-0.97	-.0821126	-1.28	-.1098439*	-1.66
			(.0540208)		(.0639643)		(.0662663)	
PCI	-	-	-	-	.0333922	0.77	.0558757	1.24
					(.0434481)		(.0451198)	
DTGpop	-	-	-	-	-	-	-.0942548**	-2.01
							(.0468164)	
Constant	1.529965***	4.29	1.986021***	3.22	1.981236***	3.17	2.152596***	3.43
	(.3564481)		(.6174494)		(.6255179)		(.627591)	
R^2	0.09		0.10		0.10		0.12	
Prob>F	0.0007		0.0012		0.0026		0.0007	
No. of obs.	169		169		169		169	
F (5, 163)	4.52		F (6,162)	3.87	F (7,161)	3.31	F (8,160)	3.59
AIC Score	60.410			61.601	63.122			60.749

Source: Survey data 2014-15

Note: 1. ***, **, * represent significance at 1%, 5% and 10% level respectively;

2. Figure in parentheses indicates standard errors of the coefficient

Table 10: Village-wisePer Capita Food Expenditure on Heme and Non-Heme Food Product at Monthly Basis during 2014-15

	Non-Heme product		Heme product			Total food expenditure
Villages	Cereals	Vegetables	Fish	Meat	Others	
Muhimari	273.68	109.14	52.11	36.12	42.76	513.82
Patgaon	257.45	125.96	68.09	54.79	50.64	556.91
Janzimukh	238.30	111.70	49.04	50.43	57.45	506.91
Lepetkatta TE	205.33	117.73	39.60	36.67	61.33	460.67
Kadamoni	221.95	119.88	65.73	59.51	51.22	518.29
Shakumato TE	290.20	101.67	31.23	25.00	56.67	504.75
Silcoori TE	243.16	130.32	27.89	23.47	56.53	481.37
Motinagar	264.71	116.86	25.88	23.73	55.20	486.37

Table 11: Distribution of Sample Household According to their Ownership of Land

Landholding	No.	%
No landholding	86	50.89
above 1 acres	33	19.53
less than 1 acres	50	29.59
Total	169	100

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