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Analysis of Socio-Demographic Determinants of Malnutrition among Under Five Children in Mubi South local Government Area: A Binomial Regression Model Approach.

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Abstract. Food insecurity has worsen in Nigeria as farmer fled their farming activities due fear of attacks from worsening insurgent activities in the northeast geo-political zone, which used to be the producer of staple cereals in Nigeria. The paper examines the socio-demographic determinants of malnutrition among children below five years in Adamawa Northern Senatorial Zones, targeted at Mubi-South local government area, of Adamawa state Nigeria. A Binomial Regression Approach was used because the argument is based on whether the child is malnourished or not - a holistic malnutrition view. Findings shows that mothers age, mothers' education, the type of toilet used, household size, and antenatal (ANC), were not significant and as such does not make any impact as a determining factor of child malnutrition in Mubi South. While mother's occupation, polygamy, gender and postnatal are positively significant in the overall Wald statistics father's occupation and education, source of water and breast feeding have positive and negative odd ratio for each variant. It therefore recommended that mothers should adhere to the old practice of exclusive breast feeding. Considering the prevalence of insecurity in the location, government should engage locals in making policies to reduce the level of insecurity which had affected food security and increase levels of malnutrition.

Keywords: Malnutrition, Socio-Demographic Determinant, Food insecurity , Binomial Regression

1. Introduction

Malnutrition remains a major public health problem and it appears to be getting worse in selected settings. (Food and Nutrition Bulletin, 2017), Children consuming food from polluted sources, such as drinking contaminated water from various sources such as rainwater or spring water had a higher incidence of undernutrition Tebeje, Bikes, Abebe, & Yesuf (2017). In a presentation on Early Childhood Education in the Sustainable Development Goals, from UNICEF said 60 percent (13.3 million) of Nigerian children are not achieving their full human potentials. It identified nutrition, protection, and stimulation as the basic needs of any child. Sixty percent of Nigerian children are not achieving their satisfaction. Nigeria is losing 60 percent of its human capital right from the start, (UNICEF, 2016). Globally, malnutrition contributes to nearly half of all child deaths that are more than 3 million children each year (Robert E. Black et al 2016.) Globally, undernutrition remains one of the most common causes of morbidity and mortality among children nearly20 million children below 5 years of age suffer from wasting and are at risk of death or severe impairment of growth and psychological development undernutrition leads to diseases and death in children, especially in the low and middle-income countries (World Health Organization, 2018). In Nigeria data showed that 34%,16% and 27% of under 5 in rural areas are reportedly underweight wasted and stunted respectively while 22%, 14% and 25% of those in urban areas are also reportedly underweight wasted and stunted respectively, USAID 2019.

The negative impact of malnutrition is seen in families and communities in various aspects such as economically, socially and medically (WHO 2015) Inadequate intake or adequate intake but poor absorption due to diseases and infections including

malaria, acute diarrheal disease, measles, HIV-AIDS and tuberculosis are immediate causes of undernutrition, especially if a delay occurs in seeking professional healthcare. (Ezeonwu, Ikefuna, Oguonu, Okafor, 2014), Nearly four out of five Nigerian children do not meet the world health organization recommendation for exclusive breastfeeding during the first six months of life, about 70% of children age six to 23 months are not receiving minimal acceptable diet (Federal Ministry of Health 2018).

Nigeria is facing a crisis of malnutrition and ranks second behind India among all countries with the highest number, data in Nigeria showed that 34 percent, 16 percent and 27 percent of the under-fives in rural areas are reportedly underweight, wasted and stunted respectively while 22 percent, 14 percent and 25 percent of those in urban areas are also reportedly underweight, wasted and stunted respectively in Nigeria (Federal Ministry of Health 2018). In low and middle-income countries, the first three to four months of child is a time when growth changes for too many children, and inadequate diet during that period increases the risk of stunting micronutrient deficiency illness and death. (THIS DAY 2018, NHDS 2013).
Nutrition research is helpful in order to quantify and asses the state of undernutrition in a population. nutrition indicators are categorized into biological indictors and social determinant majorly this research work is focus on the socio-demographic determinants of malnutrition among under-five in Mubi South which is part of the underlying causes differing from region to region and having similarities as well, embarking on such provides evidence based information to identify priority areas for intervention.

2. Literature

Malnutrition could also be defined as a disease condition whereby food nutrient are either indifferent supply or oversupply in the body, which result into signs and symptoms of particular disease in question (Passmore *et al* (1986). Social, economic**,** Biological and environmental factors may be underlying causes for the insufficient food intake or ingestion of foods with protein of poor nutritional quality that lead to protein-energy malnutrition (unite for sight 2015).

The data for underweight from 2000 to 2017 has shown a reasonable amount of increase in 2014 7% to 30% which all for attention, the prevalence the causes of malnutrition and food insecurity in Nigeria are multifaceted and include poor infant and young child feeding practices, which contribute to high rates of illness and poor nutrition among children under 0-20 month years; lack of access to healthcare, water, and sanitation; armed conflict, particularly in the north; irregular rainfall; high unemployment; and poverty (Nigeria Federal Ministry of Health, Family Health Department 2014).). Some of the socioeconomic and demographic factors explaining child nutrition according to studies done in different places the causes of malnutrition show the relationship between mother's level of education and their children nutritional status the percentage of women with no education increases steadily by age group. (Girma *et al* (2002) Another study by Nepal *et al* (2016) has shown that Children born to mothers without any education had odds of being stunted than those born to mothers with higher education for the year 2001, 2006, 2011 and 2016 respectively in the adjusted analysis the conducted.

Underweight and stunting were common in both groups of mothers who earn less than a thousand, there was no significant relationship between the prevalent under-weight, wasting and stunting and their source of water in the study by (Senbanjo, Adeodu & Adejujigbe, 2013). Owaoje *et al* (2016) stated Socio-economic factors significantly associated with malnutrition were residence in a high-density area, family accommodation in a single room apartment. The study by Akombi *et al* (2009) said Children of working mothers were more likely to be stunted compared to children of non-working mothers. Mzumara *et al (2014)* the result of further analysis revealed that children whose source of drinking water was improved (33.7%) were less likely to be stunted compared to children whose source of drinking water was poor (47.7%).

3. Methodology

Convenience sampling technique using primary data was used and collected using a structured questionnaire for the Data Collection**,** 400 questionnaires were administered at random in different primary healthcare center, and IDP camps/settlement across the local governments. The used of Schaiker strip, table weight and bag was used to determine the children MUAC (mid upper arm circumference) divided into three, > 13.5cm normal, 12.5 – 13.0 cm risk of malnutrition, 11.00 and below for severely malnourish; then weight measured in kg, across the primary healthcare facilities in the study area.

The study area is Mubi South Local Government in Mubi senatorial district of Adamawa state which is part of the northeastern geo-political zone of Nigeria, is one of the areas of the insurgent location, and has a population of about 182,235 as projected from the 2006 national census. The growth rate 2.9% was

projected for the Local Government. It has ten political ward namely: Dirbishi, Duvu, Gella, Gude, Kwaja, Lamorde, Mugulbu, Mujara, Nassarawo and Nduku. All wards had one effective health care service delivery; the local Government has (13) thirteen approved contracted Primary Health Care centers including General Hospital under performance based financial (P.B.F).

3.1 Empirical model

A binomial logistic regression refers to as simple as logistic regression predict the probability that an observation falls into one of two or more categories of a dichotomous dependent variable based on one or more independent variable that can be either continuous or categorical. If on the other hand it's continuous Poisson regression is required, if more than two categorical variables a multinomial logistic regression is required before running for binomial model, some certain assumption to analyze the data are given below to find solution for failed data due to problem coming associated with raw data, Penn state Eberly of science (2018).

Empirically the model is specified as:

$\text{Log}[\frac{pi\,(mal)}{1-pi\,(mal)}] = a_0 + a_1$*age + a_2 *educ+ a_3 *occu + a_4 *san + a_5*Hhold size + a_6 *pol + a_7 *gen + a_8 *Bfeeding+ a_9*sw + a_{10} * anteN + a_{11}*postN .

In the analysis above, malnutrition is the dependent variable, been malnourished or not depend on socio-economic factors, the linear probability model is depicted as

$$p_i = E(Y=\frac{1}{X_i}) = \beta_1 + \beta_2 X_i \text{ ---------------------------- (1)}$$

Where X is the socio-demographic factors and Y = 1, means that the child is malnourished. Considering the following representation of malnourished

$$p_i = E(Y=\frac{1}{X_i}) = \frac{1}{1+\exp[-(\beta_1+\beta_2 X_i)]} + \frac{1}{1+\exp(-Z_i)} \text{ ------------------ (2)}$$

Where $z_i = \beta_1 + \beta_2 X_i$

Equation is known as (cumulative) logistic distribution function, z_i ranges from -∞ to +∞, p_i ranges between 0 and 1, p_i is non-linearly related to z_i in satisfying the true condition probability model is required. Satisfying this requirement of non-linearity of p_i, X, and β's This violate the OLS assumption of linearity in parameters hence p_i is the probability of being malnourished given by $\frac{1}{1+\exp(-Z_i)}$, then (1-p_i) the probability of not been malnourished.

$$1 - p_i = \frac{1}{1+\exp(Z_i)}$$

Therefore we can rewrite the equation as $\frac{p_i}{1-p_i} = \frac{1+\exp(Z_i)}{1+\exp(-Z_i)}$

$\frac{p_i}{1-p_i}$ is the odds ratios in favor of being malnourished to the probability of not being malnourished we obtained $L_i = \ln[\frac{p_i}{(1-p_i)}] = z_i = \beta_1 + \beta_2 X_i = \frac{p_i}{1-p_i}$

4. Result

4.1 Descriptive Statistics

Table 4.1 Socio-demographic factors (determinant) of malnutrition

Parameter	Categories	Frequency	Percentage (%)
Mothers' occupation	House wife	172	46.49
	Civil servant	10	2.70
	Self employed	177	47.84
	Farming	11	2.97
	Total	**370**	**100.00**
Mothers' age			
	15-25	173	46.76
	26-35	170	45.94
	36-45	27	7.30
	Total	**370**	**100.00**
Age of child			
	0-6 months	76	20.54
	7-24 months	241	65.14
	25-36 months	45	12.16
	37-59 months	8	2.16
	Total	**370**	**100.00**
Fathers' occupation			
	civil servant	31	8.52
	Farming	93	25.54
	self employed	226	62.09
	Pastoralist	14	3.85
	Total	**370**	**100.00**

Educational level of mother			
	no formal education	162	43.78
	Primary	91	24.60
	Secondary	103	27.84
	Tertiary	14	3.78
	Total	**370**	**100.00**
Fathers' educational level			
	no formal education	119	32.16
	Primary	54	14.60
	Secondary	147	39.73
	Tertiary	50	13.51
	Total	**370**	**100.00**
Type of toilet system			
	Pit	310	83.79
	open field defecation	16	4.32
	water system	44	11.89
	Total	**370**	**100.00**
Sources of water.			
	bore hole	154	41.62
	River	72	19.46
	Well	144	38.92
House hold size		**370**	**100.00**
	3 to 5	151	40.81
	6 to 10	166	44.87
	11 and above	53	14.32
Do you practice polygamy		**370**	**100.00**
	Yes	114	30.81
	No	256	69.19
Childs gender		**370**	
	Female	186	50.27
	Male	184	49.73
		370	
Breast feeding			
	Exclusive	181	48.92
	non exclusive	189	51.08
		370	**100.00**
Anti-natal attendance			
	Yes	337	91.08
	No	33	8.92
		370	**100.00**
Post-natal attendance	Yes	271	73.24
	No	99	26.76
		370	**100.00**

Table 4.1 present the percentages and frequencies of the following parameters, where mother's occupation has prevalence of most mothers being self-employed 177(47.8%) and house wives 172(46.76) while a few of them are 11(2.97%) farmers. Mothers age ranging from 15-25 with 173(46.7%), 25-35 with 170(45.94%), 36-45 with 11(7.3%) meaning 90% of the mothers are young. Childs age shows that most of the children ages range 7-24 month, 241(65.14%), 20% of the children are 0-6 months potentially for exclusive breastfeeding, 37-59 month are just 2%, most of the children in sample population falls within the critical window period, this is the 1,000-day period from the start of a woman's pregnancy until her child's 2nd birthday which represents a critical window of opportunity. Fathers occupation, most of the fathers are self-employed 226(62.09%), farmers 93(25.54%), while 14(3.8%) are pastoralist. Just 8% of them are civil servant. Educational level of mother 43% has no formal education, 27.84% have secondary education, and 3.78% have tertiary education. Fathers educational level, 39.37% have secondary education, 32.73% have no formal education while 13.51% have tertiary education. Type of toilet system, 83.79% of the sample size are using pit toilet, while 4.32% practicing open field defecation. Source of water; 41.62% get their source of water from bore hole, 38.92% get their water from well while 19.46% get their water source from the river those from the metropolitan get their water from water vendor. Household size; 44.87% of the house hold are 6-10, this maybe as a result of them being a monogamous family while 14.32% of the house hold are 11 and above. Polygamy; 69.19% are

monogamous family while 30.81% are polygamous. Childs gender; 50.27% are female while 49.73% are male. Breastfeeding; 51.08% practices non-exclusive breastfeeding. Antenatal; 91.08% do attend while 73.24% did attend postnatal.

4.2 Socio-Demographic Determinant of Malnutrition

This research work used binomial logistic regression to analyze the socio-demographic determinant of malnutrition among children 0-59 month as shown, 370 questionnaires were analyzed using SPSS version 20, binomial logistic was used because the dependent variable is discrete (yes, no) and not multiple logistic because it ordinal and nominal independent variable there are 0 missing cases and no unselected cases. The depended variable coding includes 0 for No malnutrition and 1 for Yes or malnourished

The overall model fitness in explaining the relationship between the dependent and independent variable, the pseudo R^2 which contains cox & Snell R^2 and Nagelkerke R^2 in explaining the variation in the dependent variable based on our model ranges from 32.6% to 43.5% respectively; the values are lower than those in multiple regression that's why they are referred to as pseudo R^2. The equivalence of R- square in OLS regression which indicates the proportion of variance explained by the explanatory variables does exist in logit it rather uses psuedo R-squares statistic two of which is the cox and Snells and Nagelkerke R-sqaure among others.

The variation of malnutrition classification indicates the observed, predicted and the overall percentage cases of malnutrition, it has 0.500 value malnutrition of occurring or not,140 were observed not to be malnourished and were correctly predicted while 146 cases were observed to be malnourished and were correctly predicted, 43 were observed not to be malnourished and were predicted to be malnourished while 41were observed as yes (malnourished) and predicted as no. the overall percentage of cases in the model that were correctly predicted is 77.3%.

Logistic regression model was used to empirically verify the factors affecting malnutrition among children in Mubi South local government, malnutrition (zero-one variable) was assumed as the depend variable, the cases surveyed for malnutrition take the value 1 (187) cases while those taking the value 0 (183) cases. The predictor variable were selected and based on studies from literatures to examine the factors related to the socio-demographic factors affecting malnutrition in Mubi South Local government; explanatory variables are categorical and they have been coded in the SPSS variable coding each having a reference point either the first or the last, the other parameters compared are coded as dummy numbered 1 to the available number of parameter of explanatory variable except for reference parameter being compared to. The following were adopted as independent variable:

Mothers occupation: The last of the variable is refer to as the reference group because it is a categorical variable and has several variant, farmer is the reference group while house wife (mother's occupation 1 {yes =1, no = 0}), civil servant (mother's occupation 2 {yes =1, no = 0}), mother's occupation 3 is self-employed {yes =1, no = 0}
Childs age: divided into categories with 37-59 month as the reference group the other 3 takes the number child's age 1-3, 0-6 month is child age 1 {yes =1, no = 0}, 0-36 month is child age 3 {yes =1, no = 0},
Fathers occupation: has four variates and pastoralist as reference group, father's occupation (1-3) are civil servant – 1{yes =1, no = 0}, father's occupation 2-farmer {yes =1, no = 0}, self-employed – 3 {yes =1, no = 0},
Educational level of mother: because the variable has several variants the reference group has been identified as tertiary, no formal education is 1 {yes =1, no = 0}, mother's education 2 is primary school {yes =1, no = 0}, 3 is secondary school {yes =1, no = 0}.
Fathers educational level: reference group as tertiary because it has several variant it is shared into 3, father's occupation 1-3, 1 no formal education {yes =1, no = 0}, 2 primary {yes =1, no = 0}, 3 secondary {yes =1, no = 0},
Type of toilet used: because it has several variate so is divided into 2 categories, the last group is the reference group, while the rest are coded as 1 and 2, type of toilet 1 is pit (yes =1, no = 0), 2 open field defecation, {yes =1, no = 0},
Source of water: has 3 categories and the las variate well is the reference category, source of water 1 is borehole {yes =1, no = 0}, 2, river {yes =1, no = 0}.
House hold size: the variable in question is coded into 2 because it has 3 variate, the last one is the reference group 10 and above. 1, is 3-5 {yes =1, no = 0}, while household size 2 is 5-10 {yes =1, no = 0},
Antenatal attendance {yes =1, no = 0}),
Post-natal attendant {yes =1, no = 0},
Breast feeding: exclusive and non-exclusive {yes =1, no = 0},
Gender (female=1, male=0)
Polygamy {yes =1, no = 0},
Mothers age continuous variables

Table 4.2 Variables in the Equation

		B	S.E.	Wald	Df	Sig.	Exp(B)
	Mothersoccupation			13.885	3	.003	
	mothersoccupation(1)	2.293	.894	6.583	1	.010	9.900
	mothersoccupation(2)	2.723	1.246	4.775	1	.029	15.222
	mothersoccupation(3)	1.461	.885	2.724	1	.099	4.308
	Mothersage	.452	.258	3.079	1	.079	1.572
	Childsage			46.774	3	.000	
	childsage(1)	1.056	1.173	.810	1	.368	2.875
	childsage(2)	3.495	1.144	9.329	1	.002	32.962
	childsage(3)	4.156	1.231	11.391	1	.001	63.785
	Fatheraoccupation			16.167	3	.001	
	fatheraoccupation(1)	.663	.950	.488	1	.485	1.941
	fatheraoccupation(2)	2.510	.825	9.252	1	.002	12.308
	fatheraoccupation(3)	1.675	.804	4.340	1	.037	5.336
	Motherseducation			5.005	3	.171	
	motherseducation(1)	1.063	.787	1.822	1	.177	2.894
	motherseducation(2)	1.064	.828	1.652	1	.199	2.899
Step 1[a]	motherseducation(3)	.336	.779	.186	1	.666	1.399
	Fatherseducation			6.381	3	.054	
	fatherseducation(1)	-.339	.491	.476	1	.490	.713
	fatherseducation(2)	-.813	.535	2.311	1	.128	.444
	fatherseducation(3)	-.970	.460	4.443	1	.035	.379
	Typeoftoilet			1.836	2	.399	
	typeoftoilet(1)	.402	.496	.658	1	.417	1.495
	typeoftoilet(2)	-.481	.939	.262	1	.609	.618
	Sourceofwater			13.684	2	.001	
	sourceofwater(1)	-.969	.330	8.620	1	.003	.380
	sourceofwater(2)	-1.455	.435	11.157	1	.001	.233
	Householdsize			1.062	2	.588	
	householdsize(1)	.425	.476	.797	1	.372	1.530
	householdsize(2)	.156	.454	.119	1	.730	1.169
	polygamy(1)	.766	.339	5.100	1	.024	2.150
	gender(1)	.862	.290	8.861	1	.003	2.368
	breastfeeding(1)	-.767	.310	6.103	1	.013	.464
SStep 1[a]	antenatal(1)	.357	.598	.357	1	.550	1.429
	postnatal(1)	.767	.361	4.518	1	.034	2.154
	Constant	-8.565	1.963	19.039	1	.000	.000

Source: *SPSS 20 Data Output.*

Table 4.2 Reports the binomial logistic regression results on the demographic determinant of malnutrition among under-five children in Mubi South Local Government. The dependent variable malnutrition in each case is a dummy which equals 1 if the child is malnourished and zero if otherwise. Since the Logit model relies on the maximum likelihood estimation procedure, the resulting parameter estimates represent the probability that a child will be malnourished or not. The table 4.2 contains the Coefficient (B), Wald chi-square values used for testing 2 tailed null hypothesis and significance p-values, the degree of freedom (df), the odd ratios for predictors Exp(B) and confidence interval at 95% of each variable in the model were presented in the table. The estimated results reveal that Mothers occupation, Mothers age, child age, Fathers occupation, Mothers education, Fathers education, Sanitation, source of water, House Hold Size, Polygamy, Gender, Breast feeding, Antenatal, Postnatal were the explanatory variable in which each parameter with a positive (B) sign will lead to increased malnutrition, while a negative sign indicate that the variable will decrease malnutrition with a probability (p-value) of less than 0.05 significance and p-values above this level means the coefficient is zero (not significant). The parameter insignificantly different from zero include father and mother's education type of toilet and household size which implies that they are not determinant of malnutrition among children in Mubi South shown by their overall significance (parameter without B)

Mother's occupation is a significant with overall effect (Wald =13.885, df =3 p= 0.03) the B (coefficient) of mother's occupation (1-3) are positive, indicating that increasing affluence was associated with an increased odd of malnutrition, the odd ratio Exp (B) tells us that mothers who are house wives (mother's occupation 1) as coded in table 4.3.4 are 9.9 times more likely Than farmers to increase malnutrition. Mothers who were civil servant tag as mother's occupation 2, has an increasing more likelihood to be malnutrition compared to farmers (OR= 15.2), mother's occupation 3, which is self-employed are 4.4 times more likely to be malnutrition than farmers.

Father's occupation (1-3) has an overall significant association with malnutrition shown by the overall Wald statistic while the ORs and coefficients changes substantially and positively, civil servant were more likely to be malnourished (1.94 times) than pastoralist or 94% more likely to be malnourished. Farmers comparatively are 12.3 times more likely to be malnourished than pastoralist, self-employed are 5.3 times more likely to be malnourished than pastoralist.

Source of water (1-2) overall significance association with malnutrition are significant and negative. Household whose source of water are Borehole with (OR= 0.38) are less likely to increase malnutrition compared to well, river 0.23 times are less likely to be malnourish than those whose source of water is from well.

Polygamy has a positive relationship with malnutrition where by polygamous household are 2.15 times more likely to increase malnutrition than monogamous household.

Gender has a positive effect on malnutrition which shows that girls are more likely to be malnourished compared to boys.

Breastfeeding has a significant negative affluence on malnutrition, children whose mothers practice exclusive breastfeeding are less likely to be malnourished compared to those whose mothers do not.

Postnatal has a positive relationship with malnutrition with OR of 2.15, which indicate that those who attend postnatal are 2.15 times more likely to be malnourished compared to those who do not attend.

5. Discussion on Findings

Determinant of malnutrition among children age 0-59 months, analyzed using binomial logistic regression, had shown that the analysis of the following demographic factors Mothers occupation, Mothers age, child age, Fathers occupation, Mothers education, Fathers education, Sanitation, source of water, House Hold Size, Polygamy, Gender, Breast feeding, Antenatal, Postnatal. In which the estimation result revealed that the following parameters were not statistically significant, mother's age, mother and father's education, types of toilet used, household size and antenatal, in-other word these factors do not influence malnutrition. There is variation of malnutrition among children for the reason that location modify predictors of malnutrition such as food security among others especially in context of conflict, empirical method too can have its influence on predictors too kandala, cappucccio & madunga (2011) in this research most of the literatures reviewed are not from Nigeria and a few from Nigeria are a very from the Northern region, it also look at a holistic approach to malnutrition in general not the individual effect of the indicators (stunting wasting and underweight) using a dichotomous logit in place multinomial regression, as kandala *et al* (2011) expressed the problem of little knowledge about the linkage of child's nutrition and determinant which includes geographical location due limited methodologies

Mothers age was not statistically significant, this means that mother's age does not affect malnutrition which is in line with the study conducted by Gharti P. in rural Terrain of Eastern Nepal, it's also corresponds with the study of Hoque, Afzal, Nasrin and Mafiz (2016).

Mother's Education, from the analysis conducted above using descriptive statistic, the result shows that mothers with no formal education are 162, (43.78%) of the population, and mothers with primary education are 91 (24.60%), mothers with secondary education are 103, (27.84%) of the population, mother with tertiary education 14, (3.78%0 of the population, with most of the mothers with having no formal education and few with tertiary education supposed to have play a role in determining malnutrition, but from the result mothers education is significant and does have an impact in causing malnutrition this could be due to low financial income, where most of the household income is 10000 or less per month, and that 84% of the household have been displaced, agree with the study of Hoque *et al(2016)*, Wondafrash *e'tal* (2017), while Admassu, Bayissa, and Geremew (2017), says otherwise study. The difference in location and the study is conduct insurgent affect area

Father and Mother's Education are not significant which is in line with the study conducted. Based on the study conducted most of the mother's population don't have formal Education, while few of the fathers don't have formal Education, these didn't play a role in determining malnutrition.
Household size, 6-10 were (44.87%) and 11 and above (14.32%) of the population, household size is not significant, and doesn't have an affluence association with malnutrition in line with the study by Wonderfrash *et al (2017).* This is as result of both household having no different in the simple mean compare showing a 50% in all categories of household size less than ten and household size above ten which is in line with the study conducted. While the study conducted by Arora *et al* (2014), Owaoje *et al (2016)*. Shows that the household size is significant.

Antenatal based on the study conducted, 337 (991.08%) do attend antenatal, while 33 of the population making 8.92%, is not significant. Postnatal, based on the study conducted, 271, (73.24%) of the population, and 99 (26.76%) while postnatal indicate that is significant.

Type of Toilet used: based on the study conducted in table 4.1.1, (83.79%) uses pit toilet, open field defecation (4.3%), (11.89%) uses water system. The 4.3% practicing open field defecation, which is seen as a threat in India, the type of toilet such as pit and water system does not have an overall significance in odd ratio, in this study area the sanitation does not pose a threat in causing malnutrition, which is also in line with the study conducted by Shittu, Onabanjo, Fadare and Oyeyemi (2016), and Hoque *et al* (2016) whose study says types of toilet is not significant.
The following parameters significant are as follows, mother's occupation, child's age, father's occupation, source of water, polygamy, gender and postnatal.

Mother's occupation is significant, which is in line with the study conducted by Wondafrash, *et al* (2017), while Hoque *et al* (2016) study says that it is not significant. It shows a positive significance, which indicates an increase in malnutrition. The OR for civil servant is higher in contributing to malnutrition than house wife to farmer while self-employed is less likely to contribute to malnutrition than farmers, it could be as a result of working mother being busy to attend to their children compared to not working mother and farmers. As said by Akombi *et al* (2017)
Child's age is significant and is positively related to malnutrition, from the study it has shown that age range from 0-6 month has a lesser OR and likely hood to increase malnutrition because babies depend on breast milk while age 7-24 month has an increased likelihood and it continuously increase to 36 months with the OR 63% compared to 37-59 month of age those period are referring to window period, where mothers should start giving their children sufficient quantity and quality of food, the continuous increase to 59 month is as a result of the in-reversible effect of malnutrition from the window period not properly managed by the household; it can also be as a result of poor child weaning, or the introduction of complementary feeding. Federal Ministry of Health (2018).

Source of water has a significant effect on malnutrition in children under-five it disagrees with the study in kwara by shittu *et al (2015)*, senbanjo *et al* (2013) says that source of drinking water is not significant while Mzumara *et al* (2014), akombi *et al* (2017), senbanjo *et al* (2013) says it is significant. Those whose source of water are from borehole are less likely to have malnutrition compared to those whose water source from well while those from river is 0.23 times less likely to be malnourished compared to those household whose are from well, this is as a result of the river being a running water, compared to well if not properly taken care off can easily be contaminated.

From the results on table 4.2 income was significant and negative which means that as income increases, malnutrition reduces. Can also be seen from mean statistics where income was categorized into four (4); 1000-10000, 10001-100000, 100001-300000, 30000 and above, the comparative mean statistics (income*malnutrition) prove that low income from 1000-10000 monthly are 55% malnourished while those from the range 100000-300000 month are 0.00% malnourished; from this cross tabulation it shows that the higher the income the lesser the malnutrition. This study is in line with the study of Kalu *et al* (2018), Elochukwu (2016), Akombi *et al* (2019), that malnutrition is association with poverty and 70% of Nigerians leave below poverty line, poor household can lead to less expenditure on food, so less monthly income is associated with Malnutrition by Owaje *et al* (2016), richer household has less malnutrition than those from poor household in line with Raphael *et al* (2016). Arora *et al (2014) aqSal* (2014) & Amirul (2009) Sinkhada *et al* (2016) show that income is statistically significant.

6. Conclusion and Recommendations

Based on the findings, this study had established that socio demographic factors such as mother's age, mothers' education, the type of toilet used, household

size, and attending antenatal, was not significantly different from zero and as such does not make any impact as a determining factor of child malnutrition in Mubi South. While mother's occupation, polygamy, gender, postnatal are positively significant in the overall Wald statistics, father's occupation and education, source of water and breast feeding have positive and negative odd ratio for each variant. It therefore recommended that mothers should adhere to the old practice of exclusive breast feeding. Considering the prevalence insecurity in the location, government should engage locals is making policies to reduce the level of insecurity which had affected food security and increase levels of malnutrition.

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