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Economic Determinants of Malnutrition among School Children in Sri Lanka: With special reference to Nuwara-Eliya district

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ABSTRACT: Better health is extremely associated with proper nutritional intake. Malnutrition among children is closely associated with their individual health, brain development, future labor productivity and finally with the social and economic development. Child malnutrition is lasting as one of the serious issues affecting economic development in Sri Lanka. Therefore, identifying the prevalence and the determinants of child malnutrition is essential in the first stage of exploring the phenomena of child malnutrition. Many factors determine child malnutrition. Among these, economic determinants are crucial. The objective of this study is to investigate the economic determinants of malnutrition among school children in Sri Lanka based on the Nuwara-Eliya district. The study used primary data collected through a structured questionnaire. The stratified random sampling technique was employed to draw the sample of 378 school children. The main analysis technique was logistic regression. Descriptive statistics, ANOVA, Pearson's correlation, t-test and chi-square test were applied as supplementary techniques. The logistic regression model disclosed a significant impact of income, poverty and mother's employment on child malnutrition. The odds ratio between income and child malnutrition shows a negative effect. The probability of being malnourished for the poor is higher than for the non-poor. The highest malnutrition is recorded for the children of mothers employed in the private sector. The study suggests implementing supportive strategies to increase the income of households, alleviate poverty and introduce proper mechanisms to take care of children of employed mothers to reduce child malnutrition.

KEYWORDS: Economic determinants, Income, Logistic regression, Malnutrition, School children

I.   INTRODUCTION

Well-functioning life of a human body is essentially depending on better maintenance of health. Good health in both mental and physical is extremely associated with the proper nutritional intake. Malnutrition is existing in the status of overnutrition and undernutrition [1].Malnutrition is the deficiencies, excesses, or imbalances of energy and /or nutrients intake of a person [2]. Undernutrition is a condition that occurs due to poor nutritional status resulting from reduced food intake or impaired metabolism [3]. Child malnutrition is lasting as an adverse issue with respect to undernutrition. Among different malnourished groups in the malnutrition circle, malnutrition among children is critically and seriously affected on the economic development of any country through inefficient labor supply. Overcome the issue of child malnutrition essentially needs to success the effort of achieving economic development. Identifying the determinants of child malnutrition is in need at first stage in this effort. Household economic status is a significant factor impacted on child malnutrition [4]. Household economic status is significantly associated with malnutrition [5]. With this circumstance, investigation of the economic determinants of child malnutrition has become a preliminary step in the way of reducing the incidence of child malnutrition.

Globally, about 144.0 million of under 5-year children have become the victims of stunting, about 47.0 and 14.3 million of under 5-year children have become the victims of wasting and severe wasting respectively [6]. Annually, undernutrition has driven for more than 3 million of preventable child deaths [7]. In Sri Lanka, the incidence of child malnutrition is prevailing at a considerable level.

Table 1: Prevalence of child malnutrition by districts (Stunting with Hight-for- age)

District	Percentage below -3 SD	Percentage below -2 SD	Mean Z Score	District	Percentage below -3 SD	Percentage below -2 SD	Mean Z Score
Colombo	4.3	15.6	-0.7	Killinochchi	6.6	20.9	-1.1
Gampaha	2.9	12.8	-0.8	Batticaloa	3.6	20.6	-1.1
Kalutara	1.7	12.5	-0.7	Ampara	7.2	21.9	-1.1
Kandy	5.2	26	-1.2	Trincomalee	3.5	15.5	-1
Matale		14	-1	Kurunegala	2	17.7	-1
Nuwara Eliya	10	32.4	-1.5	Puttalam	2.9	11.7	-0.7
Galle	3.7	12.5	-0.8	Anuradhapura	5.9	19.1	-1.1
Matara	3.8	15.6	-0.9	Polonnaruwa	3	11.1	-0.8
Hambanto ta	2.6	11.8	-0.9	Badulla	6.5	20.6	-1.2
Jaffna	1.5	13.7	-0.8	Monaragala	3.5	15.9	-0.7
Mannar	4.6	20.8	-1.1	Rathnapura	4	17.8	-1.1
Vavuniya	6.1	18.7	-0.9	Kegalle	8.4	23.1	-1.2
Mullative	6	16.7	-0.9				

Source: Department of Census and Statistics, 2017

Table 1 indicates the evidence of malicious malnutrition levels for all districts in Sri Lanka. It clearly shows that the incidence of malnutrition in terms of stunting (HFA) is highest in Nuwara Eliya district. It is 32.4% and 10% below -2 SD and below -3 SD respectively [8]. In addition, in many districts including Mannar, Killinochchi, Batticaloa, Ampara, Badulla, Kegalla malnutrition is critically high. However, Sri Lanka has not been paying an adequate attention to improving nutritional status among children. Also, the research studies aimed at investigating economic determinants of malnutrition among school children in Sri Lanka are very limited even though the well-nourished and healthier children are vital in achieving economic development of the country. The objective of this study is to investigate the economic determinants of malnutrition among school children in the Nuwara Eliya district, Sri Lanka. Finding of this study will support policymakers in formulating effective policies to reduce child malnutrition backing up to reach the country development goal.

II.   LITERATURE REVIEW

Different approaches are existing in detecting child malnutrition. Theoretically, the term malnutrition is broadly defined in two aspects as overnutrition and undernutrition [1]. However, child malnutrition is much talked in term of undernutrition. Widely used anthropometric indicesavailable to assess the incidence of child malnutrition are Weight-For-Age (WFA), Height-For-Age (HFA) and Weight-For-Height (WFH) [9].Low weight-for-age, low height-for-age and low weight-for-height are known as malnutrition in the aspects of underweight, stunting and wasting respectively [9].

Previous literature has demonstrated various economic determinants of child malnutrition in different countries. An association between family income and malnutrition has been found and observed that having lower family incomes increases the prevalence of malnutrition [10]. Similarly, it was illustrated that being a child from low family income appeared to be highly malnourished [11],[4]. Nutritional status of children in rural areas are influenced by the level of parental income[12]. In Sri Lanka, it has been investigated thatlow monthly income appeared to be an important factor associated with undernutrition [13], [14], [15]. Income is associated with improving nutritional status at the upper end of the conditional weight and height distributions [16]. Higher pay is a main attribute to the nutritional status of children [12]. Poverty of household was suggested as strong and significant predictors of stunting, wasting and underweight [17]. Total expenditure had a significant effect on malnutrition [18]. Higher availability of employment is a main attribute to the nutritional status of urban children [12]. Nutrition was significantly associated with paternal occupation. [19]. It has found that mother's occupation as physical labor as a key factor for malnutrition [1]. Maternal employment appeared to be an important factor associated with undernutrition [12]. Maternal occupation and paternal occupation showed statistically significant association with nutritional status of children [20].Childhood malnutrition has a higher possibility of being because of the economic decision to sell more than the population consumes [21].

Following Fig. 1 indicates the proposed conceptual frame work which developed based on the literature for the relationships between economic determinants and child malnutrition.
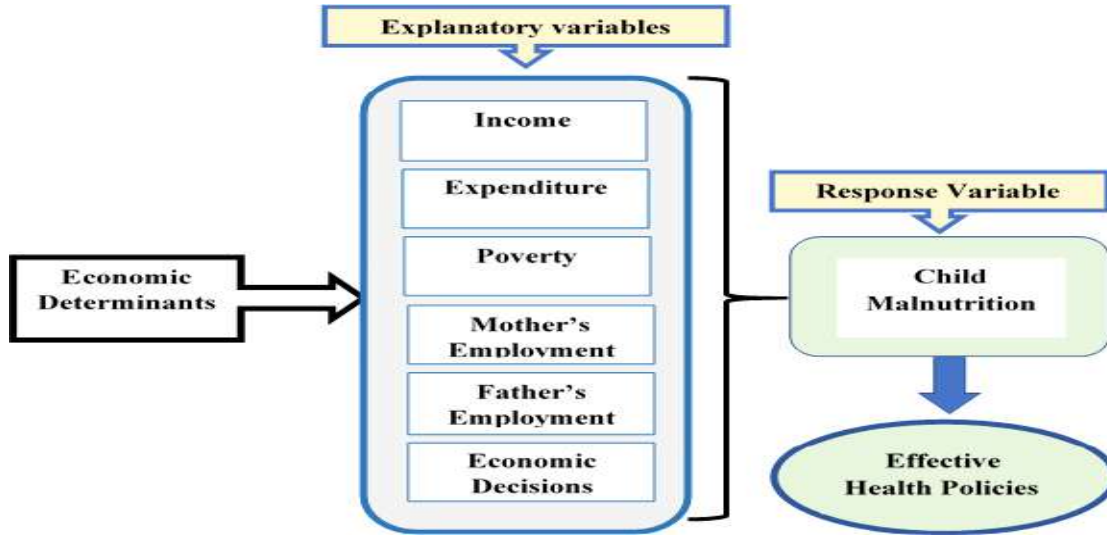
Figure 1: Conceptual framework
Source: Developed by the researcher, 2022

Hypothesis: following hypothesis will be tested using empirical data to investigate the objective of the study.

Null: There is not a significant impact of economic determinants on malnutrition among school children in the Nuwara Eliya district, Sri Lanka

Alternative: There is a significant impact of economic determinants on malnutrition among school children in the Nuwara Eliya district, Sri Lanka

III. METHODOLOGY

This study was based on the quantitative research approach. The study used primary data gathered through structured questionnaire as the main data collection method. In addition, face to face interview method was adopted in data collection. The sample was selected from grade 6 school children of government schools in the Nuwara Eliya district, Sri Lanka applying multi-stage stratified random sampling technique.
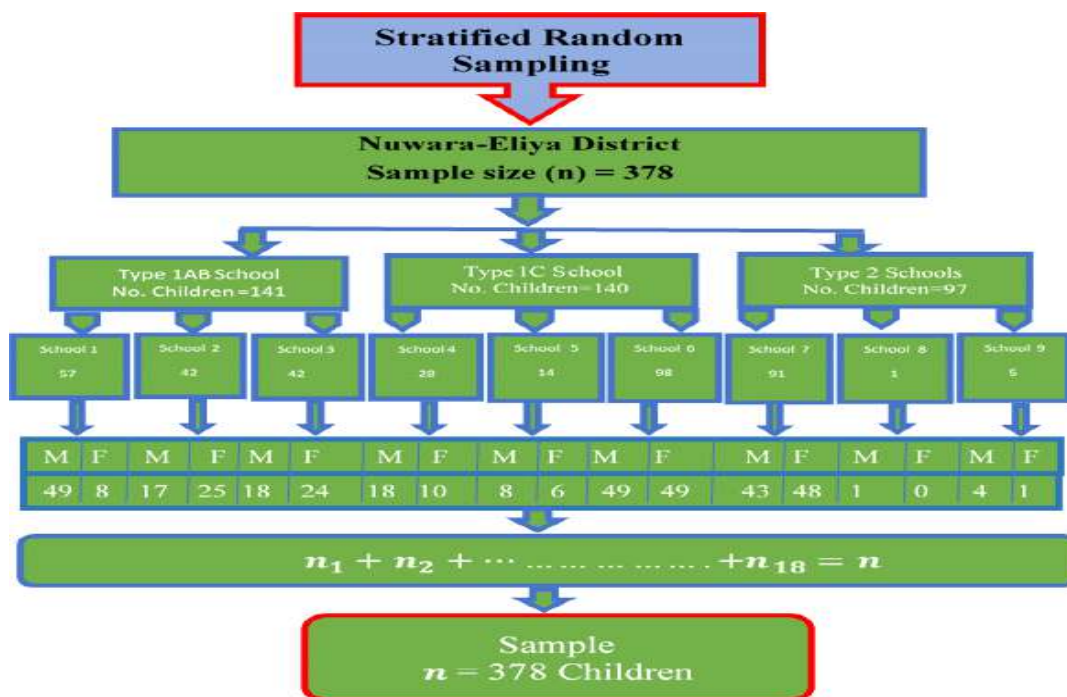

Figure 2: Sampling procedure
Source: Developed by the researcher, 2022

At the first stage, Nuwara Eliya district was selected from 25 districts in Sri Lanka as the study area purposelydue to high prevalence of child malnutrition. The government schools have been categorized in to four types i.e., type 1AB schools, type 1C schools, Type 2 schools and types 3 schools. As demonstrates in Fig. 2, three types of schools which hold grade 6 classes were considered as strata. Three schools from each type were selected randomly at the second stage. The final sampling units are grade six school children. The sample size was 378 and it was decided based on the Morgan table. Finally, sampling units were selected from grade 6 classes of the selected schools. Proportional allocation was utilized in deciding the number of male and female children. To ensure the randomness, the lottery method and random number table were adopted to select the schools from each type of school and final units (children) respectively. Considering the accuracy and consistency, the information was gathered from the parents of the selected 378 grade six school children. The ethical approval to conduct the research was obtained from ethics review committee, University of Kelaniya, Sri Lanka and agreed not to reveal individual identity of both children and schools.

Table 2: Descriptions of the variables used in the study

Variables	Dependant	Independent	Type of variable	Measurement Scale
Income		√	Continuous	Ratio
Expenditure		√	Continuous	Ratio
Poverty		√	Categorical (Binary)	Nominal
Mother's employment		√	Categorical (Multi-category)	Nominal
Father's employment		√	Categorical (Multi-category)	Nominal
Malnutrition	√		Categorical (Binary)	Nominal

Source: Developed by the researcher, 2022

The variable types and measurement scales of the response and explanatory variables ascertained for this study are given in table 2. The responses variable was measured in binary nominal scale as suffering from malnutrition coded as 1 while not suffering from malnutrition coded as 0. Three types of child malnutrition are prevailing as wasting, underweight and stunting and the malnutrition classifications were based on global standards: <-3 z score, <-2 z score, and ≥-2 z score [22]. Malnutrition in term of stunting was considered in this study and it was measured using Hight For Age (HFA) Z score.

The formula to obtain HFA z score is

$$HFA \ score = \frac{M_o - M_e}{SD_e}$$

Where,

$$M_0 = Observed \ Height \ of \ an \ individual \ in \ a \ given \ age$$

$$M_e = Medium \ Height \ of \ the \ reference \ population \ in \ a \ given \ age$$

$$SD_e = Standared \ Deviation \ of \ the \ reference \ population \ in \ a \ given \ age$$

Children with HFA z score below -2 SD of the median of reference population were considered as malnourished (stunted) and others are not malnourished (not stunted). The explanatory variables used in this study are the economic determinates. Income and expenditure are total monthly family income and expenditure and they were used as continuous variables while poverty, mother's employment and father's employment as categorical variables. The families entitled for Samurdhi was considered as poor while others are as non-poor.

The key technique of investigating economic determinants of child malnutrition is the multiple binary logistic regression analysis (Binary logit model). Descriptive statistics were used to identify the distinct characteristics of the sample. In addition, ANOVA, Pearson's correlation, t-test and chi-square test, Kolmogorov-Smirnova test and Q-Q plot were utilized to fulfil some requirements for the main analysis. To check whether the assumptions for logistic regression are violated, types of explanatory variables are essential. The explanatory variables in

logistic model belong to continuous, binary categorical and multi categorical. Therefore, different tests were used for checking multicollinearity depends on the types of explanatory variables.

The Binary Logistic Regression model is used in the analysis as follows

$$P(x) = \frac{e^{\alpha+\beta(x)}}{1+e^{\alpha+\beta(x)}} = \frac{exp(\alpha+\beta(x))}{1+exp(\alpha+\beta(x))}$$

$$P_1(x) = \frac{e^{\alpha}}{1+e^{\alpha}}$$

For Malnourished

$$P_0(x) = 1 - P_1(x) = \frac{1}{1+e^{\alpha}}$$

For not Malnourished

Where, x=0

Response variable (Y) = Malnutrition among school children

$$\text{Being malnourished} \quad (Yes=1)$$
$$\text{Not being malnourished (No=0)}$$

Explanatory variables = X,

X_1=Income
X_2=Expenditure
X_3=Poverty
X_4=Mother's employment
X_5=Father's employment

Wald test Statistics as given below was applied to check the significance of each explanatory variables

$$W_T = \frac{[\hat{\theta}-\theta_0]^2}{1/I_n(\hat{\theta})} = I_n(\hat{\theta})[\hat{\theta}-\theta_0]^2$$

Overall googness of fit of the logistic model was assesed by Hosmer and Lemeshow goodness of fit test statistics as given below.

$$G_{HL}^2 = \sum_{j=1}^{10} \frac{(O_j - E_j)^2}{E_j(1 - E_j/n_j)} \sim \chi_8^2$$

IV. Result and Discussion

4.1 Key Characteristics of the sample

The distribution of the sample of 378 school children was presented using descriptive statistics and the graphical approach regarding the economic characteristics such as income, expenditure, poverty, mother's employment, and father's employment. In addition, the study considered some of the other individual characteristics; gender, living sector, race, religion and types of school in identifying the nature of sample distribution.

Table 3: Descriptive Statistics of the sample

Characteristics	Categories	Having Malnutrition		All (%)
		Yes (%)	No (%)	
Gender	Male	14	86	55

Living Sector	Female	33	67	45
	Urban	29	71	21
Race	Rural	21	79	68
	Estate	28	73	11
	Sinhala	22	78	72
	Tamil	28	72	24
	Muslim	29	71	2
	Burger	0	100	2
Religion	Buddhist	22	78	70
	Hindu	27	73	21
	Islamic	29	71	2
Type of School	Catholic	22	78	7
	Type 1AB	22	78	37
	Type 1C	23	77	37
	Type 2	25	75	26
Expenditure	≤20000	28	72	42
	20001-30000	15	85	30
	30001-40000	19	81	18
	40001-50000	30	70	8
	>50000	23	77	2
Poverty	Poor	64	36	18
	Non-poor	14	86	82
Mother's Employability	Government	77	23	7
	Private	90	10	13
	Self-Employment	57	43	4
	Others	50	50	3
	Not Employed	03	97	73
Malnutrition		23	77	100

Source: Researcher's finding using sample survey data analysis, 2022

As provided in the table 3, considering the overall sample, percentage of children suffering from malnutrition and not suffering from malnutrition are 23% and 77% respectively. The malnourished percentage (23%) found in this study is lower than the percentage (32.4%) provided by the Department of Census and Statistics in 2017 for the Nuwara-Eliya district in the aspect of stunting which was measured through HFA Z score. Thepercentage of male (55%) is higher than the female (45%) while the percentage suffering from malnutrition is higher for female (33%) than that for the male (14%). Majority of the children (68%) in the sample live in the rural sector. The highest malnutrition is appeared in the urban sector (29%) while it is least for the rural sector (21%). Majority of the sample was represented by Sinhalese (72%) while the prevalence of malnutrition is higher for Muslims (29%) and Tamils (28) than others. Considering the religion, the highest percentage (70%) of the sample was recorded form Buddhist religion group. The percentage of having malnutrition is similar for the two religion groups of Buddhism and Catholic (22%). The malnutrition is appeared to be highest among the Islamic children (29%). Considering the type of schools, percentage of having malnutrition for the children who learning in type 2 schools (25%) is greater than the children who learning in types 1AB and 1C schools (22% and 23%). Considering the expenditure groups, the two groups that show the highest malnutrition are 40001-50000 (30%) and ≤20000 (28). Based on Samurdhi recipients, the highest malnutrition (64%) was recorded for the children belonged to poor families compared to non-poor (14%). Further it highlighted that for poor, percentage of suffering from malnutrition (64%) is higher than the percentage of not suffering from malnutrition (well-nourished) (36%). Considering mother's employment, the highest malnutrition is seen among the children whose mothers are working in the private sector (90%). For all employment groups except for never employed mothers, the percentage with malnutrition was larger (77%, 90%, 57%) than the percentage without malnutrition (23%, 10%, 43%). The lowest percentage (3%) of having malnutrition was recorded for the children of mothers who never employed.
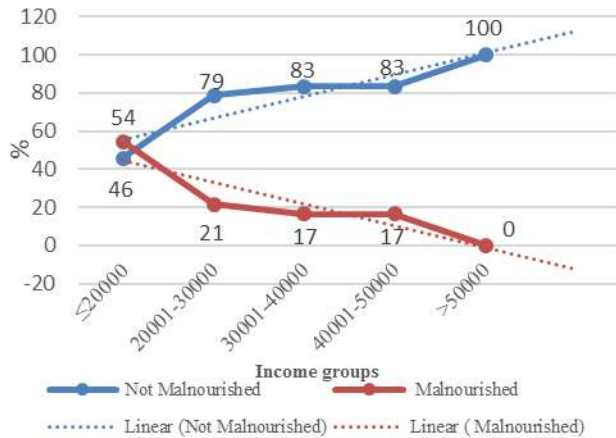
Figure 3: Family income and child malnutrition
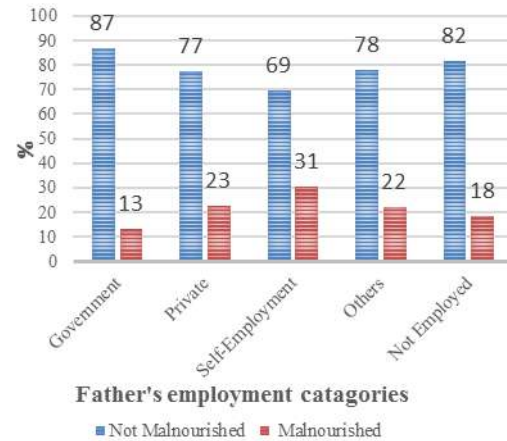Source: Researcher's finding using sample survey analysis, 2022

Figure 4: Father's employmentand child malnutrition
Source: Researcher's finding using sample survey data data analysis, 2022

As revealed by Fig. 3, percentages of children suffering from malnutrition decrease with the increase of income while percentages of not suffering from malnutrition increase with the increase of income. The highest percentage of malnutrition was recorded (54%) for the lowest income group (≤20000) and it is the only group that records the percentage with malnourishment is higher than the percentage of without malnourishment. The lowest malnutrition is seen for the highest income group (>50000). According to Fig. 4, the percentage of malnourishment is lower for the children whose fathers are employed in a government job (13%) while it is highest for children of fathers involving a self-employment (31%).

4.2 Economic determinants of child malnutrition
The study applied multiple logistic regression technique to investigate the impact of economic determinants on child malnutrition. The response variable in this study is child malnutrition which was measured in nominal binary scale. At the first step of the analysis, five economic explanatory variables, income, expenditure, poverty, mother's employment and father's employment were considered. Requirement for running multiple logistic regression model is independence among explanatory variables (Assumption of Multicollinearity). For using parametric techniques (ex. ANOVA, T test) to check for multicollinearity among continuous variables normality assumption was checked for income and expenditure.

Table 4: Kolmogorov-Smirnova test for normality

Variables	Kolmogorov-Smirnova Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
Income	0.082	378	0.053	0.978	378	0.05
Expenditure	0.096	378	0.05	0.985	378	0.049

- Lilliefors Significance Correction

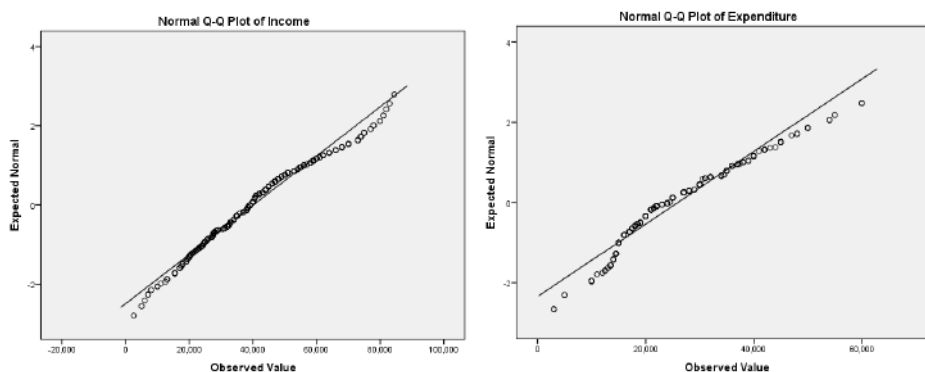Source: Researcher's finding using sample survey data analysis, 2022

Figure 5: Q-Q Plot for normality
Source: Researcher's finding using sample survey day analysis, 2022

Kolmogorov-Smirnova test (Table 4) for normality and Q-Q plots (Fig. 5) show that normality assumption was satisfied for both variables income and expenditure.

Table 5: Checking multicollinearity among economic explanatory variables

Determinants	Income	Expenditure	Poverty	Mothers' Employment
Expenditure	Pearson Correlation (p value=0.000)			
Poverty	T test (p value=0.061)	T test (p value=0.004)		
Mothers' Employment	ANOVA (p value=0.469)	ANOVA (p value=0.422)	Chi-Square (p value=0.051)	
Fathers' Employment	ANOVA (p value=0.393)	ANOVA (p value=0.000)	Chi-Square (p value=0.923)	Chi-Square (p value=0.532)

Source: Researcher's finding using sample survey data analysis, 2022

Table 5 demonstrated the results of ANOVA, t-test, the Pearson's correlation and Chi-Square test used for checking multicollinearity among all economic variables willing to be employed for logistic regression analysis based on the different types of variables. The highlighted cell clearly shows that a significant relationship exists between income and expenditure, poverty and expenditure and fathers' employment and expenditure at 0.01 level. Relationship among other variables are not significant. Therefore, the variable expenditure was removed from the model due to the violation of the assumption of multicollinearity. Finally, income, poverty, mother's employment and father's employment were retained as explanatory variables while incidence of malnutrition in terms of stunting as the response variable in the logit model.

Table 6: Results of Multiple Binary Logit Model

Explanatory Variables		B	S.E.	Wald	Sig.	Exp(B)
Income		-.050	.024	4.288	.038	.951
Poverty (1)		3.201	.695	21.244	.000	24.562
Mothers Employment				71.863	.000	
	Government	5.359	.766	48.911	.000	212.580
	Private	6.008	.772	60.571	.000	406.844
	Self-employment	4.229	.883	22.935	.000	68.635
	Others	4.288	.894	22.994	.000	72.824
Fathers Employment				1.407	.843	
	Government	-.326	1.106	.087	.768	.722
	Private	.514	.853	.363	.547	1.671
	Self-employment	.595	.853	.486	.486	1.812
	Others	.172	.789	.048	.827	1.188
Constant		-6.184	2.284	7.323	.007	.002
-2 Log likelihood		130.331				
Hosmer and Lemeshow Test		9.677 (p value=0.288)				

Source: Researcher's finding using sample survey data analysis, 2022

Tables 6 provides the results of the fitted binary logistic regression model to find the economic determinants of child malnutrition in terms of Stunting. Wald statistic was applied to test the statistical significance of each variable in the model. As highlighted in the table 6, income is statistically significant at 0.05 level while poverty and mothers' employment are statistically significant at 0.01 level indicating a significant impact of those variables on child malnutrition. Father's employment was not statistically significant in the model indicating that it does not have a direct impact on child malnutrition. Overall adequacy of the fitted model was tested using Hosmer and Lemeshow goodness of fit test. It has given the test statistics is as 9.677 with p value of 0.288 justifying the model is adequately fit in the data in this study.

Income is a key economic variable that was used as a continuous variable in the model of identifying the economic determinants of child malnutrition. Table 6 has provided the evidence of statistically significant

impact of income for child malnutrition in terms of Stunting. This result was supported by the findings of previous several studies conducted by different researchers. In rural Kelantan, Malaysia, it has beenfound that total household income β= 0.68, p <0.01 had a significant effect on malnutrition among children [18]. Further, it has been concluded that income is significant for child malnutrition [4], [19], [12] agreeing with this study.

The study found that odds ratio for one-unit change in income is 0.951 and it is less than 1 showing a negatively effect on child malnutrition in terms of Stunting holding constant the other economic predictors. When the income increases by one unit, odds of being malnourished decreases by 0.951 times. The model indicates the probability of being malnourished is decreased with the increase of income. Being a child from low income family is more likely to have malnutrition than their counterparts. The similar findings were observed by the previous study conducted at Princess Marie Louise Children's Hospital in Ghana in 2013 [10]. They found that having lower family incomes increases the prevalence of malnutrition of their children according to multivariate analysis. The studies conducted for stunting among Adivasi children age 24–59 months in Bangaladesh [11]agreed with the results found in this study. Further, several studies conducted in Sri Lanka [13],[15],[14] too supported to the findings of this study. In contrast, a study conducted in Sri Lanka has conclude that income has not a statistically significant relationship with nutritional status [23].

Poverty is another economic determinant showed a significant relationship with child malnutrition.Table 6 points out that Poverty has statistically significant impact on child malnutrition in terms of Stunting at 0.01 level. Results from this study agree with previous work conducted in India [17] which showed that bivariate Moran's I statistics of Stunting with poverty 0.52 and suggested that the poverty of household was strong and significant predictors of Stunting, Wasting and Underweight. A study conducted in Sri Lanka has concluded that malnourished children usually come from poor physical and economic resourced households [24].

The study found that odds ratio of child malnutrition in terms of Stunting for poor compared to non-poor is approximately 25 and it too indicates that odds of having malnutrition is higher among the poor children compared to non-poor children holding constant the other economic predictors. The model predicts the probability of being malnourished (Stunting) for poor is 0.05 while probability of being malnourished for non-poor is 0.002. Further it shows that 5% of poor children and 0.2% of non-poor children are malnourished. Probability of being malnourished for poor is approximately 25 times higher than as it is for non-poor with respect to Stunting. These findings pointed out that being a poor child is more likely to have malnutrition than a non-poor child.

Mother's employment was used as a categorical variable in investigating economic determinants of child malnutrition in this study. As provided in the table 6, mothers' employment has statistically significant impact on child malnutrition in terms of Stunting at 0.01 level. Supporting the result of this study, a previous study has showed the maternal occupation has statistically significant association with nutritional status of children [20]. Further, other several studies too have found that maternal employment status as an important factor associated with child malnutrition [1],[25],[13],[23],[14].

The study found that odds ratio of child malnutrition for mothers' who employed in government sector compared to mothers' who never employed is 213 and it shows that odds of having malnutrition in terms of Stunting is higher among the children whose mothers employed in government sector compared to children whose mothers are never employed holding constant the other economic predictors. The model predicts the probability of being malnourished for the children whose mothers employed in government sector is 0.30. Further it shows that 30% of children whose mothers employed in government sector are malnourished while 70% is not malnourished. Odds ratio of child malnutrition between mothers' who employed in private sector and mothers' who never employed is 407 and it shows that odds of having malnutrition in terms of Stunting is higher among the children whose mothers employed in private sector compared to children whose mothers are never employed. The probability of being malnourished for the children whose mothers employed in private sector is 0.45. Further it shows that 45% of children whose mothers employed in private sector are malnourished while 55% is not malnourished. Odds ratio of child malnutrition between mothers' who self-employed and mothers' who never employed is 69 and it shows that odds of having malnutrition in terms of Stunting is higher among the children whose mothers are self-employed compared to children whose mothers are never employed. The probability of being malnourished for the children whose mothers are self-employed is 0.12. Further it shows that 12% of children whose mothers self-employed are malnourished while 88% is not malnourished. Odds ratio of child malnutrition between mothers with other employment and mothers' who never employed is approximately 73 and it shows that odds of having malnutrition in terms of Stunting is higher among the children whose mothers with other employment compared to children whose mothers are never employed. The probability of being malnourished for the children whose mothers with other employment is 0.13. Further it

shows that 13% of children whose mothers self-employed are malnourished while 87% is not malnourished. Further, the probability of being malnourished for the children whose mothers are never employed is 0.002 and it shows that only 0.2% of children are malnourished among mothers with never employed.

These findings pointed out that the probability of being malnourished is higher for the children whose mothers are employed than the children whose mothers are never employed. The highest malnutrition is revealed among the children whose mothers are employed in private sector while the least malnourishment is seen among the children whose mothers have never employed. Further, it concludes that for all employment categories, the percentage of malnourished children is lesser than the percentage without malnourishment except for never married mothers.

However, table 6 shows that fathers' employment is not statistically significant in logit model of investigating economic determinants of child malnutrition. It indicated that fathers' employment does not directly impact on child malnutrition. This result is at variance with the results of previous several studies. Nutritional status as measured by Wasting was significantly associated with paternal occupation [19]. Paternal occupation showed a statistically significant association with the nutritional status of children [20].

V. CONCLUSIONS

This study focused on investigating the economic determinants of malnutrition among school children in the Nuwara-Eliya district, Sri Lanka using primary data collected through a structured questionnaire. Descriptive statistics have provided the sample distribution concerning economic characteristics such as income, expenditure, poverty, Mother's employment, and father's employment and some of the other individual characteristics; gender, living sector, race, religion and types of school in identifying the nature of sample distribution. The results revealed that for the sample, percentage of children suffering from malnutrition is 23% in the aspect of stunting which was measured through HFA Z score. Thepercentage of male in the sample is higher than the female while percentage of suffering from malnutrition is higher for female than that for male. Majority of the children live in the rural sector and the highest percentage of malnutrition appeared in the urban sector.

The study employed multiple binary logistic regression technique for identifying economic determinants of malnutrition among school children. The incidence of malnutrition was the binary response variable measured in a nominal scale using HFA Z-score. Based on different types of variables, the assumption of multicollinearity was checked with the use of Pearson's correlation, ANOVA, T-test and Chi-square test. Wald statistics derived from multiple logistic regression model showed that income, poverty and mother's employment were statistically significant in the model to describe the variability of the incidence of child malnutrition. These findings pointed out that the income has a negative effect on child malnutrition and being a poor child is more likely to have malnutrition than a non-poor child. Further it is evident that the probability of being malnourished is higher for the children whose mothers are employed than the children whose mothers are never employed while the highest malnutrition is recorded for the children of mothers employed in the private sector. Father's employment was not statistically significant in the model indicating the absence of its direct impact on child malnutrition. Hosmer and Lemeshow's goodness of fit test value is 9.677 with a p-value of 0.288 and it ensured that the model adequately fits the data in this study.

This study contributes to filling the existing gap in investigating the economic determinants of malnutrition among school children in the Nuwara-Eliya district, Sri Lanka. It is concluded that the child malnutrition among school children are influenced by income, poverty, mother's employment as economic determinants. The study suggested in implementing supportive strategies to increase income, alleviate poverty and introduce proper mechanisms to take care of children of employed mothers to reduce child malnutrition. This study provides a guidance in policy implications to achieve country development with overcoming child malnutrition by addressing these economic determinants found in this study with creating a fascinating environment to live in the country.

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