International Journal of Social Sciences: Current and Future Research Trends (IJSSCFRT)
ISSN: 2790-4008
https://ijsscfrtjournal.isrra.org/index.php/Social_Science_Journal

Maternal Education and Child's Nutritional Status in Nepal

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Abstract

This research examines the relationship between maternal education and three measures of child nutrition - stunting, underweight, and wasting - using data from the Nepal Demographic and Health Surveys (NDHS) conducted in 2016 and 2022. The study also measures the influence of other factors such as wealth index of the household, type of place of residence and sex of the household head on child nutritional status. Employing box and whisker plots, relationships among variables are visually portrayed. An empirical model is constructed to ascertain the extent of connection between maternal education, household wealth index, residence type, sex of household head, and the child nutritional status. The results showed that maternal education is negatively correlated with all three measures of a child's nutritional status.

Keywords: Maternal education; child's nutrition; demographic health survey; empirical model; negatively correlated.

1. Introduction

Child nutrition is a matter of global concern as approximately 45.0% of deaths among children under five years of age are linked to undernutrition (stunting, underweight, wasting)[2] [1]. In Southern Asia, 57.9% of children under age five are stunted [2]. A child's poor nutritional status is one of the challenging problems in Nepal as well. One in every three children under the age of five (32.0%) is stunted. Almost one-quarter (24.0%) of children under the age of five are underweight for their age and 12.0% of Nepalese children under the age of five are wasted. Children from impoverished households or whose mother/caretaker has little education are more likely to be stunted or wasted than children from wealthier or more educated households [3].

Received: 9/25/2023
Accepted: 10/30/2023
Published: 11/10/2023

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Early childhood nutrition affects not only health but also education, productivity, and economy. Productivity loss that accounts for 3.0% to 16.0% (or more) of GDP in low-income settings, costs the global economy and society US$3.0 trillion annually, indicating that undernutrition has a significant negative economic impact on both lost national production and economic growth [4]. Undernutrition in the first two years of life is associated with lower human capital [5].

It has been discovered that maternal education plays a significant role in the child's nutritional status. Well-educated women have the ability to acquire nutrition and health knowledge, follow the recommended feeding practices and increase command over resources. Research conducted in various countries has validated the above-mentioned statements. In Malawi, Tanzania, and Zimbabwe, it was discovered that mother's education level is an important determinant of the nutritional status of their children [6]. In Pakistan, it was found that the poor nutritional status of children was significantly associated with the low literacy rates of mothers [7]. In Mozambique, it was reported that compared to children whose mothers have lower or no educational attainment, children whose mothers have completed elementary education are significantly more likely to be well-nourished [8].

Female education is still an issue in some parts of Nepal. Even though there is not much gender disparity in primary school enrollment, females frequently leave school, especially in the upper grades [9]. The consequences of the lack of proper female education have not been given much attention. In regard to a child's nutrition, many people are unaware of how maternal education impacts it.

Hence, this research aims to find out the relationship between maternal education level and a child's nutritional status in terms of stunting, underweight, and wasting. It also aims to find out the relationship between other demographic factors such as wealth index of the household, type of residence, sex of household head and the nutritional status of the children (stunting, underweight and wasting).

2. Literature review

Several studies have been conducted to understand the linkage between child's nutritional status and mother's healthcare behavior, maternal autonomy and other socioeconomic factors such as age and sex of children, mother's education and wealth of household.

Dhakal demonstrated a significant positive relationship between education and various aspects of maternal healthcare utilization, such as antenatal care visits and postnatal care services - all that influences the child's nutritional status. However, it was also concluded that while a mother's education is necessary, it alone is not enough to guarantee the adequate use of maternal and child health services [10]. This research emphasizes on the influence of various factors on the maternity care services only.

The authors in [11] found that the education status of a mother, along with various factors such as the age of children, geographical provinces, and household wealth status are significant predictors of the child's nutritional status in terms of stunting. This paper however is limited to the study of only one measure of child's nutritional status that is stunting. In [12] the authors found that among health and environmental determinants, access to the

government health facility is associated with stunting while receiving all basic vaccines, handwashing with soap and water, and access to media to protect against stunting. Furthermore, they mentioned that socioeconomic determinants of stunting are province and household size, while wealth quintile and mother's education are protective factors. Moreover, they stated that the socioeconomic determinants of Minimum Acceptable Diet (MAD) are province, residence, wealth quintile, caste/ethnicity and mother's education. This study also does not consider other measures of child's nutritional status that are underweight and wasting.

Dancer & Rammohan argued that maternal autonomy variables have a limited influence on child nutrition measures, but household wealth has a large positive impact on child nutrition, both short-term and long-term. They also mentioned that a study of the role of maternal decision-making power and control over assets on the nutritional status of children is an important issue in a developing country like Nepal, where health and education outcomes remain poor for large segments of the population [13]. Their study is however based on rural Nepal only and the dataset used is of 2006 NDHS.

In [14] it was found that for the non-extreme cases of malnutrition, the low level of mother's educational attainment was connected with the incidence of malnutrition in children. That is, in families where the mother was more educated, children exhibited fast recovery from malnutrition. This report only provides insights on stunting and malnutrition in children. Joshi and others showed a highly significant association ($p<0.005$) of maternal factors like literacy, occupation, diet knowledge, and monthly per-capita income respectively with child nutrition. They also argued that maternal education status as well as socio-economic status, occupation, and dietary knowledge are important determinants of nutritional status of school children [15]. However, this study was conducted in 2007 and accounts only for the children of Western Nepal. In [16], while examining the progress in maternal and child nutrition from mid 1990s to 2010 in Nepal, authors used quantitative findings to argue that the majority of the improvements in maternal and child nutrition are the result of four main things: greater access to health services (especially during pregnancy), increased coverage and use of toilets, higher levels of education, particularly among mothers, and wealth accumulation. The findings from this study may not reflect the current state of the field. Shrestha and peers examined the relationships between stunting, wasting, and underweight and the four domains of the Early Childhood Development (ECD) Index (literacy-numeracy, physical, social-emotional, and learning development) in children 36–59 months of age and concluded that targeted ECD interventions within nutrition programs are required for children who are stunted, underweight, have mothers with limited education, and come from low-income households in order to foster overall childhood development [17]. However, this paper does not account for the influence of maternal education on stunting, underweight and wasting. The authors in [18], discovered a substantial negative relationship between the risk of stunting and household wealth and access to resources, as well as a strong association between lower maternal educational attainment and child stunting. Additionally, it was also found that female-headed households had less stunted children than male-headed households. The findings from this research are limited to stunting only.

This study aims to fill the above-mentioned gaps by providing comprehensive explanation on the influence of mother's education as well as wealth index of household, type of place of residence and sex of household head on the three measures of child's nutritional status - stunting, underweight and wasting, using the most recent

datasets of 2022 NDHS.

3. Data

The data used in this study is extracted from the dataset of NDHS, 2022 and 2016.The Demographic and Health Survey (DHS) Program is responsible for collecting and disseminating accurate, nationally representative data on health and population in developing countries. This paper accounts for household and children's datasets. The women interviewed for the NDHS survey were between the ages 15-49. The study considers data of children aged 0-59 months belonging to interviewed, de facto women.

The 2016 data is used as a secondary dataset to conduct comparative analysis with the 2022 dataset, the primary dataset. After adjusting for the missing values in the variables the total number of samples for the year 2016 is 2452 and for the year 2022 is 2691.

The independent variables are mother's educational attainment level, wealth index of the household, type of place of residence and sex of household head while the independent variable is child's nutritional status. Mother's educational attainment level is divided into five categories. The categories are no education, incomplete primary (1-5), complete primary (6-8), incomplete secondary (9-10), complete secondary (11-12) and higher (13 and above). The categories for the wealth index are poorest, poorer, middle, richer and richest.

The wealth index is calculated using data from the household questionnaire, which collects information on household assets and wealth-related characteristics. Standardized scores are assigned to each asset using principal components analysis, and households are ranked based on their total scores.[a] The type of place of residence has two factors – urban and rural.

The administrative units and their characteristics are used to classify rural and urban areas.[b] The member of the household who manages household activities, makes decisions and takes responsibility for all household-related matters is known as the head of the household. The sex of the household head can be male or female. This study measures the child's nutritional status with three factors – stunting, underweight and wasting. The children whose height for age z score is below minus 2 standard deviations (sd) below the mean or whose height for age sd is below -200 on WHO Child growth standards is considered as being stunted.

Similarly, the children whose weight for age z score is below minus 2 sd below the mean or whose weight for age sd is below -200 on WHO Child growth standards is considered as being underweight.

Likewise, the children whose weight for height z score is below minus 2 sd below the mean or whose weight for height sd is below -200 on WHO Child growth standards is considered as being wasted.[c] Hence, in our study, higher the height for age sd, lower is the stunting, higher the weight for age sd, lower is the underweight and higher the weight for height sd, lower is the wasting.

[a] More information on Methodology for Wealth Indexing
[b] More information on DHS - Sample Design
[c] More information on Nutritional Status

3.1. Statistical overview of the variables

Table 1: Overview of the descriptive statistics from 2022 dataset.

Variables	Percent
Children's Nutritional Status	
Stunted	27.4
Underweight	19.0
Wasted	7.1
Mother's Educational Attainment	
No education	21.4
Incomplete Primary	29.4
Complete Primary	7.3
Incomplete Secondary	27.7
Complete Secondary	10.8
Higher	3.5
Wealth Index	
Poorest	34.3
Poorer	21.0
Middle	19.2
Richer	15.3
Richest	10.2
Type of place of Residence	
Rural	49.5
Urban	50.5
Sex of the household head	
Male	66.9
Female	33.1

Note: Total number of units - 2691

According to Table 1, 27.4% of the children are stunted, 19.0% of them are underweight and 7.1% of them are wasted. Regarding the educational attainment level of the mothers, 21.4% of them had no education. Likewise, 29.4% of them had incomplete primary education and 7.3% of them had complete primary education.

The incomplete secondary education was among 27.7% of the respondents, 10.8% of them had complete secondary education and 3.5% of them finished higher education.

The percentage of households classified as poorest was 34.3%. Meanwhile, 21.0% of participants fell under the poorer category, 19.2% to the middle category, 15.3% were categorized as richer and 10.2% were categorized as the richest. The number of participants residing in rural areas was 49.5%, while those living in urban areas were 50.5%. The majority of respondents - 66.9% had a male headed household, while 33.1% had a female headed household.

3.2. Box and whisker plots of the variables

3.2.1. Mother's educational attainment

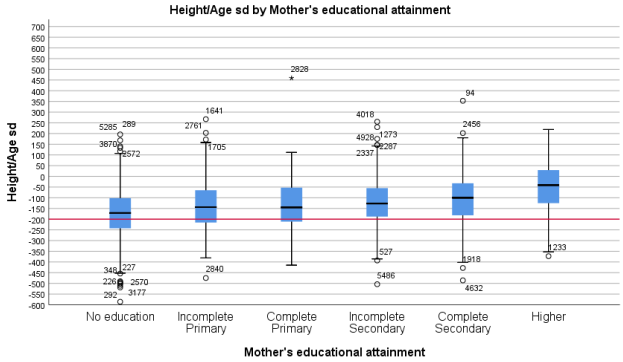

Figure 1: Trends of stunting, as measured by height for age sd, across mother's educational attainment levels.

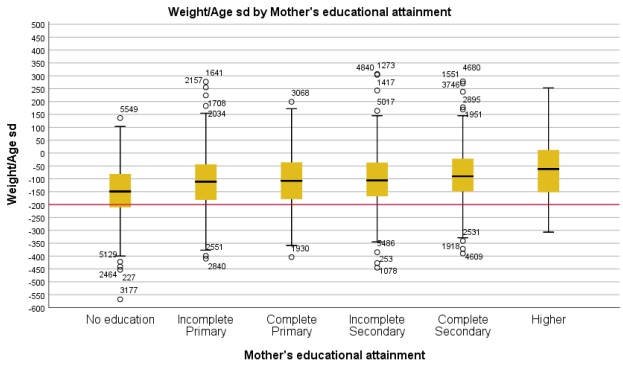

Figure 2: Trends of underweight, as measured by weight for age sd, across mother's educational attainment levels.

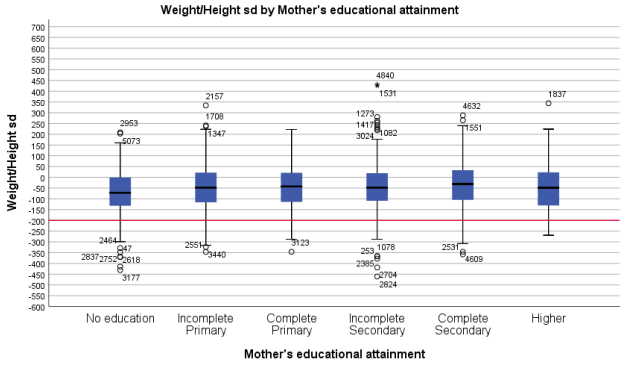

Figure 3: Trends of wasting, as measured by weight for height sd, across mother's educational attainment levels.

According to figures 1, 2 and 3, keeping other things constant, a mother's educational attainment level had an inverse relationship with the level of stunting in children. As the mother's education level increased, the stunting in their children declined and vice versa. The mother's education level also had a relationship with the underweight of their children. As the level of the mother's education increased, the underweight in their children declined. However, the women with complete secondary and higher education had the same relationship with weight for age sd of the children. Among the participants, women at all educational levels had no wasted

children.

3.2.2. Wealth index

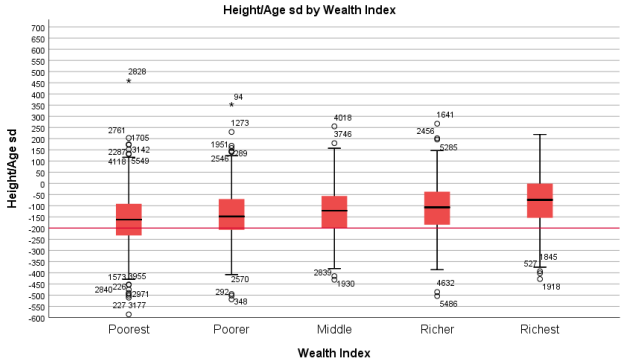

Figure 4: Trends of stunting, as measured by height for age sd, across wealth index categories.

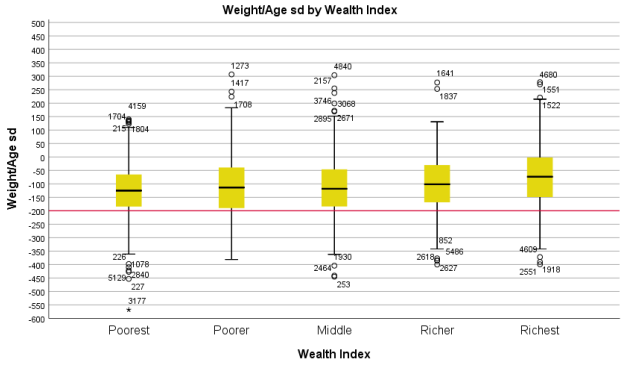

Figure 5: Trends of underweight, as measured by weight for age sd, across wealth index categories.

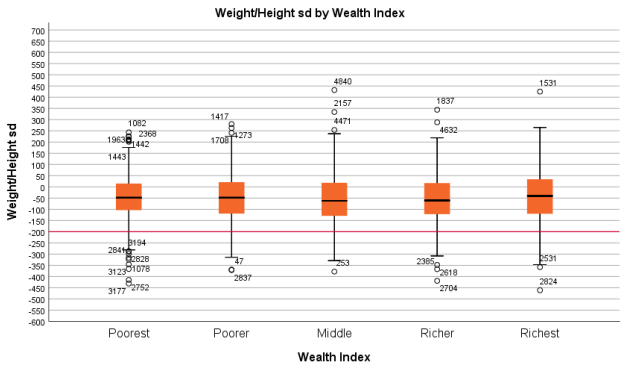

Figure 6: Trends of wasting, as measured by weight for height sd, across wealth index categories.

According to figures 4, 5 and 6, the wealth index of the household also had an inverse relationship with the stunting of the children.

As the wealth of the household increased, the level of stunting in the children declined and vice versa. The

wealth index of the household and the underweight as well as wasting in children did not show relationship graphically.

3.2.3. Sex of household head

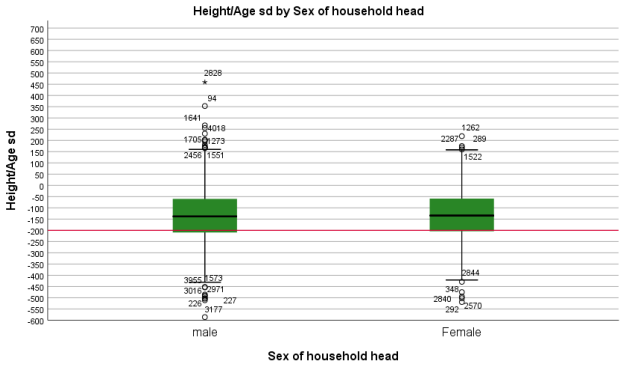

Figure 7: Trends of stunting, as measured by height for age sd, across the sex of household head.

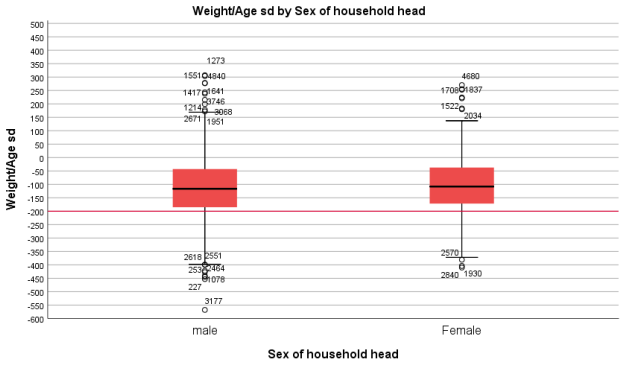

Figure 8: Trends of underweight, as measured by weight for age sd, across the sex of household head.

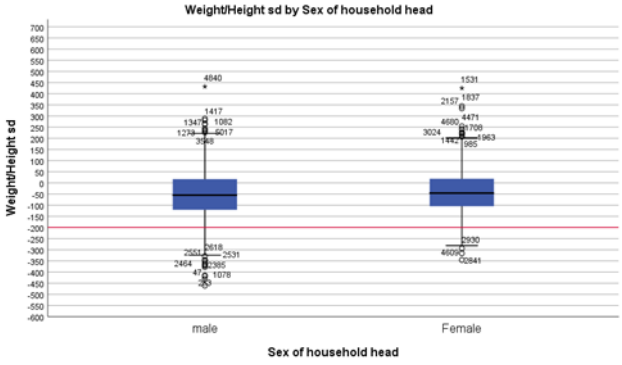

Figure 9: Trends of wasting, as measured by weight for height sd across the sex of household head.

As seen from figures 7, 8 and 9, the level of stunting is slightly more in the household where there was a male head. The relationship between sex of household head and underweight and wasting could not be spotted graphically.

3.2.4. Type of place of residence

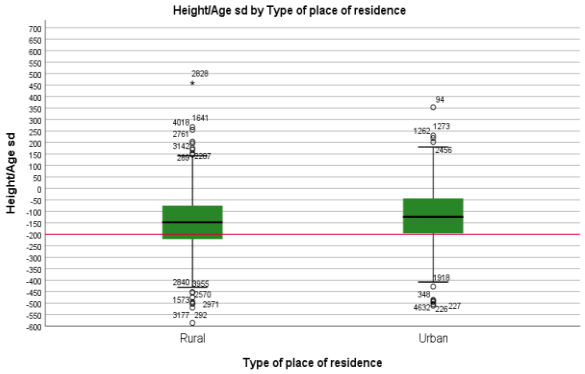

Figure 10: Trends of stunting, as measured by height for age sd across the type of place of residence.

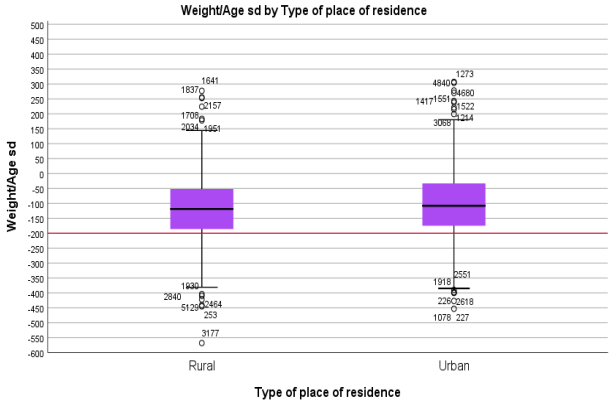

Figure 11: Trends of underweight, as measured by weight for age sd across the type of place of residence.

Figure 12: Trends of wasting, as measured by weight for height sd across the type of place of residence.

From figures 10, 11 and 12, the studied children living in the rural area had a higher level of stunting as compared to the studied children living in the urban area.

The type of place of residence did not show a graphical relationship with the level of underweight and wasting.

4. Methodology

The study is quantitative in nature. The data was cleaned, adjusted for missing values and analyzed using the Statistical Package for Social Sciences (SPSS) software. Descriptive statistics was used to summarize the dataset. Box and whisker plot was used to visualize the relationship between maternal education, wealth index of household, type of place of residence and sex of household head with child's nutritional status - stunting, underweight and wasting. The box represents the interquartile range (IQR), with the central line inside the box representing the median. The whiskers extend from the minimum to the maximum values within 1.5 times the IQR. Data points beyond this range are represented as individual points or outliers. An empirical model was established using regression analysis to understand the level of the relationship between the maternal education, wealth index of household, type of place of residence, sex of household head and child's nutritional status - stunting, underweight and wasting. Regression analysis was used to examine the relationship between the independent and dependent variable. The regression coefficient, also known as the slope coefficient or beta coefficient, represents the change in the dependent variable for a one-unit change in the independent variable(s). The sign of the regression coefficient indicates direction, absolute value indicates magnitude and statistical significance indicates whether the relationship observed occurred by chance. In this study, the regression analysis with the significance value less than 0.1 is considered as a statistically significant result.

4.1. Empirical model

Empirical models were formed using linear and multiple regression analysis to understand on what level maternal education, wealth index, type of place of residence and sex of household head impact the children's nutritional status (stunting, underweight and wasting). Model 1, represented by the equations (1), (4), and (7) was used to find the effect of maternal education on a child's nutritional status, keeping other things constant. Model 2, represented by the equations (2), (5) and (8) was used to find the effect of maternal education and wealth index on a child's nutritional status. Model 3, represented by the equations (3), (6) and (9) was used to find the effect of maternal education, wealth index of the household, type of place of residence and sex of household head on child's nutritional status.

$$\text{H/A SD} = \beta_0 + (\beta_1 \text{MEA}) + \varepsilon \quad (1)$$

$$H/A\ SD = \beta_0 + (\beta_1 MEA) + (\beta_2 WIH) + \varepsilon \quad (2)$$

$$H/A\ SD = \beta_0 + (\beta_1 MEA) + (\beta_2 WIH) + (\beta_3 TPR) + (\beta_4 SHH) + \varepsilon \quad (3)$$

where,

H/A SD = Height for age standard deviation

MEA = Mother's Educational Attainment

WIH = Wealth Index of Household

TPR = Type of Place of Residence

SHH = Sex of Household Head

In equation (1), the dependent variable is the height for age sd. β_0 is the y-intercept which represents the baseline value of a dependent variable when the independent variable is zero. β_1 is the regression coefficient which indicates the direction and strength between independent and dependent variables. Mother's educational attainment is the independent variable and ε represents the error term. Keeping other things constant, the equation (1), helps us to determine the direction and strength of the relationship between maternal education and height for age sd. In equation (2), along with mother's educational attainment, the wealth index of the household is also considered to understand the effect on height for age sd. β_2 is the regression coefficient for the wealth index of the household. Likewise, in equation (3), the dummy variables – type of place of residence with value 1 as 'urban' and sex of household head with value 1 as 'female' are added to understand how a mother's educational attainment, wealth index of household, type of place of residence and sex of household head collectively influence the height for age sd. β_3 and β_4 are the regression coefficient for type of place of residence and sex of household head respectively.

$$W/A\ SD = \gamma_0 + (\gamma_1 MEA) + \varepsilon \quad (4)$$

$$W/A\ SD = \gamma_0 + (\gamma_1 MEA) + (\gamma_2 WIH) + \varepsilon \quad (5)$$

$$W/A\ SD = \gamma_0 + (\gamma_1 MEA) + (\gamma_2 WIH) + (\gamma_3 TPR) + (\gamma_4 SHH) + \varepsilon \quad (6)$$

where,

W/A SD = Weight for age standard deviation

MEA = Mother's Educational Attainment

WIH = Wealth Index of Household

TPR = Type of Place of Residence

SHH = Sex of Household Head

Similarly, the figures above represent the equations for measuring on what level does maternal education alone (4), maternal education and wealth index (5) and maternal education and wealth index along with dummy variables - type of place of residence and sex of household head (6) impact weight for age sd. γ_1, γ_2, $\gamma_3$and γ_4 are the respective regression coefficients for mother's educational attainment, wealth index of the household,

type of place of residence and sex of household head.

$$W/H\ SD = \delta_0 + (\delta_1 MEA) + \varepsilon \quad (7)$$

$$W/H\ SD = \delta_0 + (\delta_1 MEA) + (\delta_2 WIH) + \varepsilon \quad (8)$$

$$W/H\ SD = \delta_0 + (\delta_1 MEA) + (\delta_2 WIH) + (\delta_3 TPR) + (\delta_4 SHH) + \varepsilon \quad (9)$$

where,

W/H SD = Weight for height standard deviation

MEA = Mother's Educational Attainment

WIH = Wealth Index of Household

TPR = Type of Place of Residence

SHH = Sex of Household Head

Likewise, the above figures represent the equations for measuring on what level does maternal education alone (7), maternal education and wealth index (8), maternal education, wealth index and dummy variables - type of place of residence and sex of household head (9) impact weight for height sd. δ_1, δ_2, δ_3 and δ_4 are the respective regression coefficients for mother's educational attainment, wealth index of the household, type of place of residence and sex of household head. It is crucial to emphasize that the positive or negative regression coefficient of the height for age sd suggests a corresponding positive or negative correlation with a certain variable. Given the inverse relationship between height for age sd and stunting level, the positive regression coefficient indicates an inverse relationship and negative regression coefficient indicates a direct relationship with stunting. This relationship applies similarly to weight for age sd and weight for height sd.

5. Analysis and results - part one

Before we present the analysis and results of the latest available dataset i.e., of NDHS 2022, here is the brief outlook of results of the NDHS 2016. According to the NDHS 2016, (as shown in Table A1) 36.0% of them were stunted, 26.9% of them were underweight and 9.5% were wasted. Among the participants, the percentage of women with no education was the highest with 33.0%. Likewise, 12.2% of them had incomplete primary education and 6.8% of them had complete primary education. The incomplete secondary education was among 25.2% of the respondents, 7.7% of them had complete secondary education and 15.2% of them finished higher education. On measuring the wealth index of the respondents, 24.6% of them fell under the poorest, 21.9% under poorer and 21.7% under middle. Likewise, 20.0% of the participants fell under richer and 11.8% of them

were the richest. The number of participants living in rural areas was 43.3% and the number of participants living in urban areas was 56.7%. Among the respondents, the majority, 67.8% of them had male household head while 32.2% of them had a female household head. In considering the statistically significant results from empirical models (as shown in Table B3) a negative causal relationship was spotted between mother's educational level and stunting as well as wealth index and stunting. The one unit increase in the mother's education level decreases the stunting level in children by 10.473 units and the one-unit increase in the wealth index decreases the level of stunting by 17.382 units. Likewise, (as shown in Table B6), an inverse relationship was seen between mother's educational level and underweight as well as wealth index and underweight. The one-unit increase in the mother's educational level decreases the level of underweight in children by 11.401 units and the 1-unit increase in the wealth index of the household decreases the level of underweight in children by 7.978 units. Furthermore, (as shown in Table B9), the mother's educational attainment and wasting as well as sex of the household head and wasting were seen to be negatively correlated. The one-unit increase in the mother's educational level decreases the level of wasting in children by 7.670 units and the female headed households have wasting decreased by 8.663 units as compared to the male headed households.

6. Analysis and results - part two

Below presented is the regression analysis from the 2022 NDHS data.

6.1. Height for age sd

Table 2: Regression coefficient demonstrating the level of influence of mother's educational attainment level on stunting.

Variable	Unstandardized B	Sig.
Mother's educational attainment	17.533	0.000

Table 3: Regression coefficients demonstrating the level of influence of mother's educational attainment level and wealth index categories on stunting.

Variables	Unstandardized B	Sig.
Mother's educational attainment	12.910	0.000
Wealth Index	14.534	0.000

Table 4: Regression coefficients demonstrating the level of influence of mother's educational attainment level, wealth index categories, type of place of residence and sex of household head on stunting.

Variables	Unstandardized B	Sig.
Mother's educational attainment	12.944	0.000
Wealth Index	13.537	0.000
Type of place of residence	10.527	0.018
Sex of household head	8.319	0.064

According to Table 2, the empirical model showed a negative relationship between a mother's educational attainment level and stunting. Keeping other things constant, a one-unit increase in the mother's educational

level decreases the level of stunting by 17.533 units, indicating a stronger relationship as compared to that of 2016. When the mother's educational attainment and the household wealth index are combined (as shown in Table 3) to explain the degree of stunting, it showed that a one-unit increase in the wealth index reduces stunting by 14.534 units and one-unit increase in the mother's educational attainment reduces stunting by 12.910 units. When all the four variables are considered, according to Table 4, a one-unit increase in the mother's education level decreases the stunting level in children by 12.944 units and 1 unit increase in the wealth index decreases the level of stunting by 13.537 units. The urban households have the stunting decreased by 10.527 units as compared to rural households. The children living in the household where there is a female head have their stunting decreased by 8.319 units as compared to the children residing in the household where there is a male head. All the above mentioned results are statistically significant at 0.05 significance level except for the result for the variable - sex of the household head which is statistically significant at 0.1 significance level.

6.2 Weight for age sd

Table 5: Regression coefficient demonstrating the level of influence of mother's educational attainment level on underweight.

Variable	Unstandardized B	Sig.
Mother's educational attainment	13.611	0.000

Table 6: Regression coefficients demonstrating the level of influence of mother's educational attainment level and wealth index categories on underweight.

Variables	Unstandardized B	Sig.
Mother's educational attainment	11.883	0.000
Wealth Index	5.432	0.000

Table 7: Regression coefficients demonstrating the level of influence of mother's educational attainment level, wealth index categories, type of place of residence and sex of household head on underweight.

Variables	Unstandardized B	Sig.
Mother's educational attainment	11.923	0.000
Wealth Index	5.030	0.002
Type of place of residence	6.125	0.136
Sex of household head	11.219	0.007

According to Table 5, an inverse relationship was found between mother's educational level and underweight. A one-unit increase in the mother's educational attainment level decreases the underweight in children by 13.611 units. When the mother's educational attainment level and wealth index are considered together, (as shown in Table 6), a one-unit increase in the weight index decreases underweight by 5.432 units and one unit increase in the mother's educational level decreases underweight by 11.883 units. In considering all four variables, as evidenced from Table 7, the one unit increase in mother's educational level decreases underweight by 11.923 units, one unit increase in the wealth index decreases underweight by 5.030 units. Female headed households have underweight declined by 11.219 units compared to male headed households. The above-mentioned results are statistically significant at the significance level of 0.05. For the type of residence, the statistically

insignificant result suggested that the urban households have underweight declined by 6.125 units compared to rural households.

6.3 Weight for height sd

Table 8: Regression coefficient demonstrating the level of influence of mother's educational attainment level on wasting.

Variable	Unstandardized B	Sig.
Mother's educational attainment	5.483	0.000

Table 9: Regression coefficients demonstrating the level of influence of mother's educational attainment level and wealth index categories on wasting.

Variables	Unstandardized B	Sig.
Mother's educational attainment	6.823	0.000
Wealth Index	-4.211	0.006

Table 10: Regression coefficients demonstrating the level of influence of mother's educational attainment level, wealth index categories, type of place of residence and sex of household head on wasting.

Variables	Unstandardized B	Sig.
Mother's educational attainment	6.855	0.000
Wealth Index	-3.915	0.015
Type of place of residence	-0.107	0.979
Sex of household head	10.227	0.015

According to Table 8, an inverse relationship was depicted between maternal education and wasting. Keeping other things constant, the one unit increase in the mother's educational attainment level decreases wasting by 5.483 units.

When the mother's educational attainment level and wealth index are considered together, as shown in Table 9, a one-unit increase in the weight index increases wasting by 4.211 units and one unit increase in the mother's educational level decreases wasting by 6.823 units. When all the four variables are considered together, according to Table 10, the 1-unit increase in the mother's educational level decreases the level of wasting by 6.855 units. However, a one-unit increase in the wealth index of the household increases the level of wasting in children by 3.915 units. For the variable sex of household head, the positive coefficient indicates that children living in the household where there is a female head have wasting decreased by 10.227 units as compared to the children residing in the household where there is a male head.

The above-mentioned results are statistically significant at 0.05 significance level. A negative coefficient of the type of place of residence indicates that the children residing in urban households have wasting increased by 0.107 units as compared to the children residing in rural households. This result however is statistically insignificant.

7. Discussions

Using the data from the NDHS for the year 2016 and 2022, a model was formed in order to understand the association between maternal education and three measures of a child's nutritional status - stunting, underweight and wasting. From the descriptive statistics, it was found that the stunting, underweight and wasting has declined from 2016 to 2022. However, a report from UNICEF mentioned that although in Nepal the pace of reduction in stunting level in children is good, the country still faces nutrition related issues and that the progress in advancing in child's nutrition is not up to par [19]. The percentage of mothers with no education have also declined and the percentage of mothers who have incomplete primary education, complete primary education, incomplete secondary education, complete secondary education increased. The improved maternal education can be one of the important determinants in reduction of the three measures of child's nutritional status. Our empirical model also resonates this relationship. Maternal education depicted an inverse relationship between all three measures of a child's nutritional status. Educated mothers demonstrate a good healthcare behavior in terms of healthcare utilization, hygiene, sanitation and feeding nutrition which is why highly educated mothers have low stunted, underweight or/and wasted children and this finding is consistent with the previous study from the literature review in [10]. The effect of maternal education on child stunting and underweight is greater in 2022 than in 2016, indicating an increased importance of maternal education on child's nutrition. There have been several initiatives from the government as well as from the non-governmental organizations in improving girls' education in Nepal. However, even though many girls attend school in primary level, the eventually drop out of it [19]. Therefore, this underscores the critical importance for the organizations to focus on secondary and higher-level education for girls. The Girls Education Program (GEP)[d] and School Sector Development Plan (SSDP)[e] are some of the initiatives that have emphasized not only on primary education but also in the secondary education for girls. However, as the issue of enrollment of girls in higher education still exists in substantial level, the country is greatly in need of more such initiatives to witness a greater involvement of women in secondary and higher education. As mentioned earlier, it is crucial to recognize that the higher the educational attainment of women, the greater the potential benefits, including improved child nutrition, enhanced labor force productivity, and overall economic development. Other factors such as the wealth index of the household, type of place of residence and sex of the household head are also used to understand the child's nutritional status. Wealth index of the household has an inverse relationship with stunting and underweight in children. Economically poor households have lower chances of getting education, quality diet and good healthcare access which is why poorer households have greater stunted and underweight children and this finding is consistent with the findings from [11]. Interestingly, it was noted that having a female household head was associated with lower stunting, underweight and wasting as compared to male headed households. Female headed households are likely to have smaller household size, receive remittance and have decision making power over children's health. This finding also aligns with the finding from [18]. It was also found that urban households have lower levels of stunting as compared to rural households. Rural households tend to face limited access to healthcare, low socio-economic status and have reliance on agriculture as the primary source of livelihoods.

[d] More information on Room to read
[e] More information on SSDP

8. Limitations of the study

Prior research on the influence of maternal education on stunting, underweight and wasting of children is limited and several of them have become outdated. In analyzing the 2016 NDHS data, the type of place of residence and sex of the household head could not be linked with stunting and underweight due to statistically insignificant results. Similarly, the wealth index and type of place of residence could not be linked with wasting due to statistically insignificant results. Results from 2022 NDHS data, showed that increased wealth resulted in an increased wasting in children and this anomaly demands further research into the matter. Also, the results on the impact of type of place of residence on underweight and wasting in children did not reach statistical significance, despite the substantial correlations discovered in this study. These distinctions demonstrate the complexity of the dynamics of child nutrition and suggest the existence of other environmental influences that call for additional study.

9. Conclusion

The issue of poor child nutrition is still prevalent in Nepal that is causing notable deaths in children under the age of five. Maternal education has been highly associated with the child's nutritional status. Higher the education level of the mothers, well nourished their children can be. Over time, the nation's productivity and economic development are significantly impacted by the health of its children. It is therefore incumbent upon the authorities to concentrate on higher female education in Nepal, given the strong correlation between maternal education and child nutrition. Alongside developing maternal education, as wealth index, sex of household head and type of place of residence are also highly or moderately related to child's nutritional status, it is also important to focus on poverty alleviation, rural development and women empowerment to improve nutritional status of children.

Acknowledgements

I would like express my gratitude to my mentor Pradhyumna Wagle for his deliberate guidance throughout my project. Sincere appreciation to authorities from NDHS for providing me with the valuable dataset essential for this research.

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Appendix

Appendix A

Table A1: Descriptive statistics from 2016 NDHS data.

Variables	Percent
Children's Nutritional Status	
Stunted	36.0
Underweight	26.9
Wasted	9.5
Mother's Educational Attainment	
No education	33.0
Incomplete Primary	12.2
Complete Primary	6.8
Incomplete Secondary	25.2
Complete Secondary	7.7
Higher	15.2
Wealth Index	
Poorest	24.6
Poorer	21.9
Middle	21.7
Richer	20.0
Richest	11.8
Type of place of Residence	
Rural	43.3
Urban	56.7
Sex of the household head	
Male	67.8
Female	32.2

Note: Total number of units - 2452

Appendix B

Regression Tables - 2016

1. Height for Age standard deviation

Table B1: Regression coefficient demonstrating the level of influence of mother's educational attainment on stunting.

Variable	Unstandardized B	Sig.
Mother's educational attainment	14.859	0.000

Table B2: Regression coefficients demonstrating the level of influence of mother's educational attainment level and wealth index categories on stunting.

Variables	Unstandardized B	Sig.
Mother's educational attainment	10.528	0.000
Wealth Index	17.759	0.000

Table B3: Regression coefficients demonstrating the level of influence of mother's educational attainment level, wealth index categories, type of place of residence and sex of household head on stunting.

Variables	Unstandardized B	Sig.
Mother's educational attainment	10.473	0.000
Wealth Index	17.382	0.000
Type of place of residence	3.424	0.535
Sex of household head	-7.283	0.190

2. Weight for Age standard deviation

Table B4: Regression coefficient demonstrating the level of influence of mother's educational attainment level on underweight.

Variable	Unstandardized B	Sig.
Mother's educational attainment	13.466	0.000

Table B5: Regression coefficients demonstrating the level of influence of mother's educational attainment level and wealth index categories on underweight.

Variables	Unstandardized B	Sig.
Mother's educational attainment	11.485	0.000
Wealth Index	8.124	0.000

Table B6: Regression coefficients demonstrating the level of influence of mother's educational attainment level, wealth index categories, type of place of residence and sex of household head on underweight

Variables	Unstandardized B	Sig.
Mother's educational attainment	11.401	0.000
Wealth Index	7.978	0.000
Type of place of residence	1.784	0.690
Sex of household head	2.386	0.596

3. Weight for Height standard deviation

Table B7: Regression coefficient demonstrating the level of influence of mother's educational attainment level on wasting.

Variable	Unstandardized B	Sig.
Mother's educational attainment	6.928	0.000

Table B8: Regression coefficients demonstrating the level of influence of mother's educational attainment level and wealth index categories on wasting.

Variables	Unstandardized B	Sig.
Mother's educational attainment	7.674	0.000
Wealth Index	-3.059	0.081

Table B9: Regression coefficients demonstrating the level of influence of mother's educational attainment level, wealth index categories, type of place of residence and sex of household head on wasting.

Variables	Unstandardized B	Sig.
Mother's educational attainment	7.670	0.000
Wealth Index	-2.792	0.123
Type of place of residence	-2.117	0.655
Sex of household head	8.663	0.069