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# Socio-Economic Correlates of Children's Nutritional Status: Evidence from Pakistan Demographic and Health Survey 2017-18

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***Abstract*** *Nutrition status is an important indicator of child health. This study estimates the effect of socioeconomic determinants on children's nutritional status of under five years of age. We apply the Composite Index of Anthropometric Failure (CIAF) in our empirical analysis as a proxy measure to denote the malnutrition measurement index, and a binary logistic regression model using PDHS dataset for 2017-18. The logistic regression model inspects the probability of malnutrition among children. The result demonstrates that the age of children, education and employment status of mothers, BMI of mothers, assets owned by mothers, tetanus vaccination of mothers, the incidence of diarrhea in children, and household wealth has a significant impact on malnutrition in children. The study concludes that socioeconomic deprivations and inequalities in society play a significant role in determining the health and nutrition of pre-school children.*

**Key Words:** Binary Logistic Model, CIAF, Pakistan Demographic, and Health Survey, Wealth Index

**JEL Classification:** I11, I31, J13

## Introduction

Globally, the major cause of child mortality is malnutrition. Pakistan is the sixth most populous country and an emerging economy with the second-highest rates in morbidity and mortality of infants and children in the South Asia region. According to the Pakistan Demographic and Health Survey (PDHS) 2017-18, 38% of under-five children are stunted, 7% wasted, and 23% underweight. It is described as the condition that is caused by taking an unbalanced diet missing some nutrients. It is also an indicator of poverty. Generally, it is observed that disease, malnutrition, and poverty are so closely interrelated with each other that they all need to be addressed simultaneously (Rice et al., 2000). Malnourishment is a multidimensional and manifold topic. If the mother is suffering from malnutrition, it can severely affect the unborn child such as low birth weight, higher chances of illness, physical as well as mental disabilities, and more chances to be an anaemic adult (World Bank, 1994). It is considered that if malnutrition

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occurs during the first two years of child age or pregnancy, there will be a permanent problem of mental and physical development. Therefore, much more importance is given to mothers' body mass index (BMI) and her nutrition during pregnancy so that she can bear a healthy child. The outcomes of malnutrition not only affect the single child but also transfers from generation to generation particularly female malnutrition, e.g. malnourished girl to malnourished mother that give birth to a malnourished child (Khan and Raza, 2014).

In developing countries, the role of women is dual, earning income for the family and providing care for their children. The primary role of men is to earn income for the family, and they are not involved or less involved in the child's care (Evans 1995; Ananda-lakshmy 1994; Olmsted and Weikart 1995). While the primary role of the mother is to provide complete care to their child, but their participation in the workforce does not allow them to spare enough time for preparing nutritious food and adequately breastfeed their children. The care that is provided to a child might be insufficient in quantity and quality. The women bear the opportunity cost between poor nutrition status of child and tradeoff as an active worker.

It is often observed that female children are more malnourished compared to a male child due to gender discrimination at the household level, i.e. differentiation in caring practices during illness, unequal food distribution among male and female children. Malnutrition in girls in their adulthood or reproductive age can cause to create a vicious cycle of undernutrition and poverty (Mehrotra 2006; Choudhury et al., 2000). The positive effect of increasing household wealth by working women can overweigh the negative effect of providing inadequate time to childcare (Glick, 2002). There are various serious causes of malnutrition in adults and children in developing countries such as infectious diseases, improper and inadequate care, short dietary intake, junked as well as unbalanced food distribution within households. The proper nutritional diet of children ultimately reflects the general health condition of those children. When a child takes sufficient nutrient food, then he is not exposed to frequent illness as well as reach their full potential growth (Khan and Raza, 2014).

In Pakistan, the causes of malnutrition are poverty, high population growth, lack of sufficient diet, the burden of diseases, illiteracy, lack of safe drinking water, and inequality among children. A child's malnutrition is associated with low family income, a mother's illiteracy, and large family size that causes higher mortality and morbidity rate. In Pakistan, the mortality rate among children under age five is 72 per 1000 children that are higher side as compared to other regional countries (Khan, 2014). In Pakistan, several factors are related to a child's poor health during the duration of disease. Nutritional problems of women such as iron deficiency, lower body mass index during pregnancy affect children's health inversely. A malnourished mother's children are more likely to face lower resistance to infection, mental weakening, the higher hazard of diseases and mortality, and short stature in whole life. The culture and norms of Pakistani households are also associated with malnutrition during illness. The beliefs of people to restrict some particular food during illness for example breast milk should not be given to children during diarrhoea and milk, and rice should not be given during fever, particularly fever with the cough. However, these essential nutrients are important for a child during illness, as these help early recovery from diseases. On the contrary, restriction from food not only causes malnutrition but also causes late recovery from illness (Hirani, 2012). Childhood malnutrition is associated with higher chances of

a vast array of illnesses like heart diseases, failure of organs, and diabetes which occurs later in life (Latham and Cobos, 1971). In Pakistan, overall, 38% of under five-year children are stunted, 7% are wasted, and 23% are under-weight (PDHS, 2017-18).

## Analytical Framework

Most of the researches on the assessment of children malnutrition pursue the framework function of Strauss and Thomas (1995) and Becher (1965), which is Household Production Function. The study starts with household maximization utility function, the assumption set in this study is that each child lives in a unit called a household, and the household maximizes its utility as follows:

$$U = u\ [L, N, X] \quad \text{..... (1)}$$

In equation (1), our household's utility is composed of consumption of different vector of possessions (*X)*, leisure (*L)*, and child's quality of nutritional status (*N)*:

$N^i$ is taken as a standard measurement of anthropometry, stunting (HAZ), under-weight (WAZ), and wasting (WHZ). These three indices are used as the standard measure of the nutritional status of children recommended by the World Health Organization. In this function, we assume that better nutrition is enviable in its own rights which are represented through the nutritional status of children's vector. Further, we also assume that the decision regarding degrading consumption are made by households is based on different reasons rather than nutritional improvement (Pitt and Rozenzweig, 1995).

Many constraints, such as income and nutritional production function with time-specific, maximize the household's utility. Equation 2 explains the nutrition function in reduced form for each child guided by underlying determinants, which can be derived as follow:

$$N^i = n\ [H, Z, W, C, \varepsilon] \quad \text{.....(2)}$$

In equation 2, *C* shows consumption, *W* represents the vector of specific children factors; *H* represents the vector of specific household factors; *Z* represents the vector of health factors, while the error term of children-specific is $\varepsilon$. The function in the reduced form above captures the overall effect of the child, health, and household factors rather than impact condition by a structural function on a set of factors based on choices (Stress and Thomas, 1995).

The reduced specified form of nutrition function of production estimates the below equation:

$$CIAF_i = \text{f (household factors, health factors, child factors, } \varepsilon\text{CIAF)}$$

In this equation, i denote the $i^{th}$ group (which can be defined by year, gender, or region), $\varepsilon$CIAF is a random error assumed with covariates in the reduced form which shows nutrition outcome function can be uncorrelated.

## Specifications of Model and Methodology

The study relies on Newman and Anderson's model. The selection of explanatory variables in the model is based on individual, maternal, household, and disease factors. The focus of this research is to check the effect of different socioeconomic correlates of nutritional status of under-five children.

**Specification of Model**

Composite Index of Anthropometric Failure (CIAF) is the dependent variable that is in binary form in our study. The econometric equation of the model is as under:

CIAFij= ß0CAMij+ß1GOCij ß2BONij+ß3NCFj+ß4HCHIij+ß5MAGEij+ß6MBMIij+ ß7MELij+ ß8MESij+ ß9AOWij+ ß10RTIij+ ß11TPRij+ ß12HDRij+ ß13WIij+Ɛij

In the above equation, coefficients are ß's, which explains the degree of association with dependent variable CIAF while error term is Ɛ. Definition, as well as description of the variables used in the model, are reported in below given Table 1:

**Table 1.** Description of the variables of our study

| Name of variable | Operational Definitions |
|---|---|
| Variable (Dependent): | |
| Composite Index of Anthropometric Failure (CIAF) | Child is Malnutrition=1, Otherwise=0 |
| Independent Variables: | |
| Child's Characteristics | |
| Child's gender (GOC) | male=1, female=0 |
| Age of child in Months (CAM) | Measured as a continuous variable |
| Birth order number (BON) | Measured as a count variable |
| Maternal Characteristics | |
| Mother's Age (MAGE) | Measured as a continuous variable |
| Mother's Employment Status (MES) | 1 if employed, 0 if not employed in the last 12 months |
| Mother's Education Level (MEL) | Illiterate=0, primary=1, Secondary=2, Higher=3, |
| Mother's Body Mass Index (MBMI) | 0 if BMI<18.5kg/$m^2$, 1 if BMI>=18.5kg/$m^2$ |
| Received Tetanus Injections (RTI) | 1 if working, 0 if not working |
| Assets Ownership by Women (AOW) | 1 if yes, 0 if no |
| Household characteristics | |
| Residence Place (TPR) | 1=urban, 0=rural |
| Children' numbers under 5 years of age in a Household (NCF) | Measured as a count variable |
| Household Covered by Health Insurance (HCHI) | 1 if yes, 0 if no |
| Wealth Index (WI) | 1=poorest,2=poorer,3=middle,4=richer,5= ri chest |
| Disease factors | |
| Had diarrhea recently (HDR) | 1 if yes, 0 if no |

**Sources and Data Descriptions**

In this research, data of 3280 children below five years of age is used from the Pakistan Demographic and Health Survey 2017-18 which is collected by the National Institute of Population Studies (NIPS), Islamabad, Pakistan. WHO (2006) proposed a standard growth measurement for children's nutritional status, and these are stunting, wasting, and underweight? The nutritional status of children in this study is measured through CIAF based on WHO standards.

### Construction of CIAF

A Composite Index of Anthropometric Failure (CIAF) index is generated to estimate the presence of malnutrition in children. It is used as an indicator of nutritional value. According to WHO standards (2006), there are three indices, measured in the form of Z-Scorein CIAF. These indices are stated below:

1) Stunting if Z-Scores of height-for-age < -2 S.D.
2) Wasting if Z-Scores of weight-for-heights < -2 S.D.
3) Underweight if Z-Scores of weight-for-heights < -2 S.D.

However, these three indices may not provide a comprehensive estimation. According to CIAF classification, children are divided into seven groups which are as follows:

A: No Failure, B: Stunted only, C: Wasting only, D: Underweight only, E: Stunted and underweight, F: wasting and underweight, and last is G: stunting, wasting, and underweight. The total measure of child malnutrition prevalence is calculated by combinations of all except group

A. It is binary variable use "1" if a child is malnourished otherwise use "0" if a child is not malnourished.

### Construction of WI (Wealth Index)

In DHS, the wealth index is built based on household assets data which includes some consumer items such as bicycle, car, television, drinking water sources, sewerage facilities, drinking water sources as well as the quality of material used for flooring. It is an indicator of the wealth level consistent with income and expenditure measures (Rutstein, 1999).

## Results and Discussions

Results of the logistic regression show that malnutrition of a child is positively associated with a child's age in months, mother's BMI, mother's employment, and incidence of diarrhea in children. The results further indicate that mother's education, mother's assets ownership, mothers who received tetanus injections, and wealth index has a negative effect. The percentage of the existence of CIAF as per the characteristics of a Child are reported in Table 2. The logistic results are reported in Table 3.

**Table 2.** The Estimation of Child Malnutrition % of each variable

| CIAF | Percentage CIAF in children (%) |
|---|---|
| Gender of the children | |
| Male | 49.81 |
| Female | 47.94 |
| Age of child in months | |
| < 6 months | 37.63 |
| 6-12 | 42.04 |
| 13-18 | 40.99 |
| 19-24 | 58.39 |
| 25-36 | 56.02 |
| Birth order number | |

| | |
|---|---|
| ≤ 2 | 45.39 |
| 2-4 | 48.92 |
| 4-7 | 55.07 |
| >7 | 50.57 |
| Mother age at the first childbirth | |
| ≤ 20 | 46.74 |
| 21-25 | 49.54 |
| 26-30 | 50.79 |
| 31-35 | 46.95 |
| 36-40 | 48.51 |
| >40 | 44.44 |
| Mother educational level | |
| Illiterate | 57.97 |
| Primary | 44.00 |
| Secondary | 37.58 |
| The higher education category | 21.21 |
| Mother employment status | |
| Not employed | 47.74 |
| Employed | 56.83 |
| Mother body mass index | |
| MBMI < 18.5kg/m$^2$ | 58.77 |
| MBMI ≥ 18.5kg/m$^2$ | 47.58 |
| Assets ownership by Mother | |
| No | 49.44 |
| Yes | 24.00 |
| Received Tetanus Injection | |
| Yes | 43.73 |
| No | 56.49 |
| Place of residence | |
| In rural | 52.70 |
| In urban | 43.27 |
| Number of Children under Five in a household | |
| <1 | 41.67 |
| 1 | 49.53 |
| 2 | 48.89 |
| 3 | 45.75 |
| 4 | 52.21 |
| Household Covered by Health Insurance | |
| No | 49.12 |
| Yes | 30.77 |
| Wealth Index | |
| Poorest | 62.73 |
| Poorer | 54.79 |
| Middle | 44.20 |
| Richer | 36.81 |
| Richest | 25.32 |
| Had diarrhea recently | |
| Yes | 54.37 |
| No | 47.11 |

***Source:*** *Authors estimation*

**Table 3.** Results of Binary Logistic Regression for CIAF

| CIAF | Coefficient | Standard error | z-value | p-value |
|---|---|---|---|---|
| Child's gender (Female-reference) | | | | |
| Male | .1190995 | .1311604 | 0.91 | 0.364 |
| Child's age in Months (Continuous variable) | | | | |
| | .2832383 | .0455673 | 6.22 | 0.000* |
| Birth Order Number (Measured as count variable) | | | | |
| | .0409645 | .1011211 | 0.41 | 0.685 |
| Mother's Age (Continuous variable) | | | | |
| | -.1104128 | .0769555 | -1.43 | 0.151 |
| Mother's Education (No education- reference) | | | | |
| Primary | -.3798914 | .2149192 | -1.77 | 0.077*** |
| Secondary | -.4341069 | .2115976 | -2.05 | 0.040** |
| Higher | -.9827027 | .2829124 | -3.47 | 0.001* |
| Mother's Employment Status (Not working from last 12 months-reference) | | | | |
| Working | .3440288 | .2045818 | 1.68 | 0.093*** |
| BMI of the mother (Below 18.5 kg/m$^2$- reference) | | | | |
| ≥18.5kg/m$^2$ | .3618145 | 2171992 | 1.67 | 0.096*** |
| Mother's Ownership of Assets (No-reference) | | | | |
| Yes | -1.066413 | .5426021 | -1.97 | 0.049** |
| Received Tetanus Injections (No-reference) | | | | |
| Yes | -.3047205 | .1473999 | -2.07 | 0.039** |
| Wealth Index (Poorest- reference) | | | | |
| Poorer | -.2288062 | .1778078 | -1.29 | 0.198 |
| Middle | -.5274201 | .2205889 | -2.39 | 0.017* |
| Richer | -.793024 | .2579232 | -3.07 | 0.002** |
| Richest | -1.057582 | .2921921 | -3.62 | 0.000* |
| Children' numbers under age five (Continuous variable) | | | | |
| | -.0041709 | .0608735 | -0.07 | 0.945 |
| Incidence of Diarrhea (No-reference) | | | | |
| Yes | .3346226 | .1532509 | 2.18 | 0.029** |
| Type of Residence (Rural-reference) | | | | |
| | .2122423 | .1573925 | 1.35 | 0.178 |
| Household Covered by Health Insurance (No-reference) | | | | |
| | -.265721 | .6631997 | -0.40 | 0.689 |

**The overall significance of the model**

| | |
|---|---|
| Total observations= 1086 | Prob > Chi$^2$= 0.0000 |
| LR-Chi$^2$ (19) = 148.23 | Pseudo-R$^2$= 0.0985 |

***Note:*** ****, **, * represents the significance level at 10, 5, and 1 percent.*
***Source:*** *Authors estimation*

## Child Age (in Months)

Regression results show that as the age of child increases, the probability of being malnourished also increases. Malnutrition of child increases up to a specific age; after that age, they show a decline. The study's results are in corroboration with previous studies [Wamani, et al., 2004); Garcia and Alderman, 1989; Hien and Hoa, 2009;

Rahman and Chowdhury, 2007; Das and Rahman 2011]. It reflects that most of the parents are not able to provide proper nourishment requirements for their children as per the child age.

**Body Mass Index of Mothers**

A healthy mother bears a healthy child. In the worse case, low BMI of the mother due to their poor nutrition status gives birth to a low-weight baby, and in infancy, there exists a huge probability of malnutrition among children. The risk of low birth babies increases with mothers' low BMI<18.5 kg/m$^2$ (Khan and Raza 2014). The results of our study show that a mother's BMI positively influences the exposure of being malnourished. Our result findings are not in line with these studies [Victora et al., 2008; Mbuya et al., 2010; Das and Rahman, 2011; Menon et al., 2018].

**Education of Mother**

The results indicate that a mother's education is inversely related to the risk of undernourishment. The consequence of the results is that if the education of mothers decreases, it increases the risk of being undernourished. On the base of results, the study suggests that education for females should be compulsory so that they could cope with the problem of malnutrition of their children. The education status of the mother and its status in society is also the most important factor that affects the nutritional outcome of children in their adult age. Education provides females, an ability, and awareness for participating in economic activity which contributes to the total income of the household. Generally, one of the presumptions is that these economic activities positively correlates with the health of a child. The mother may have a significant contribution to the household's income and have basic information regarding their child's health if she is highly educated, particularly their nourishing practices plays a significant role in reducing child malnutrition's risk. The following researches support the results [Reyhan et al., 2006; Mukherjee et al., 2008; Babatunde et al., 2011; Karmaker, 2015; Kudane et al., 2015; Khan et al., 2019]. Early childbirth has an impact on the mother and its own health. Educated mothers have fewer children with higher intervals in the child's birth, and she can take well care of and provide better medical provision for their children.

**Household Wealth**

The regression analysis indicates that the wealth index is negatively associated with the risk of being malnourished. It further shows that as the decrease in the wealth of households takes place, the malnutrition risk also increases significantly. The study and investigation reveal that families with better economic status, have more resources for taking good care of their children, can provide a balanced nutritious diet, and if needed can afford proper medication as well. The good socioeconomic status of the household helps to reduce the gender disparity in nutritional outcomes. Malnutrition is not only a symptom of ill health but also a cause of poverty (Mehrotra 2006; Khan et al., 2019). The study correlates with the analysis that in comparison to poor households, children are more malnourished as they have less or no money to purchase food. Occupation Position of the Mother

Mother's Occupation Position is a paramount feature to measure malnutrition. If the mother has a higher designation in her profession, it increases the income of the household. Consequently, the increase in the earnings of the household will buy more

quality food in ample amount (Nair et al., 2012). Similarly, previous studies also show that the mothers who belong to poor families, either spend their entire incomes in meeting other household's expenditures rather than focusing on their children's nutritional requirements. Nair et al., (2012) studied the effect of employment guarantee rural national act in India on children malnutrition, determined that mothers with employment generating schemes have less number of the underweight child as compared to mothers with no participation. The result of the study shows a positive association of mother's employment status with low risk of child's malnutrition. The findings of the analysis are consistent with (Abbi et al., 1991; Rabiee and Geissler., 1992; Khan et al., 2019.

### Received Tetanus Injections

The inferences show a negative association of women having tetanus vaccination with the risk of the child being not malnourished. In other words, women have a high probability of having childbirth with good health if they are vaccine by tetanus. If the women are vaccinated before the birth of the child, it increases resistance against diseases as compared to those women who have not received the vaccination. The findings of the analysis are in line with (Dubale Mamoro et al., 2018; Hussain et al., 1999).

### Ailment in Children

Diarrhea, respiratory infections, and malnutrition are three major causes of death during infancy (Irena et al., 2011). The regression results show a positive association of the child had diarrhea with the risk of being malnutrition. The results show that a child who has diarrhea incidence has more probability of being malnourished than the one who has not. Diarrhea becomes more dangerous if the child belongs to a deprived family. The child loses many minerals, and in this situation, the child needs a better diet to overcome the weakness. However, poor families mostly treat their children discriminately. The findings of the work links with the available literature on the subject. The findings are in harmony with (Arif et al., 2012; Khan et al., 2019).

### Assets Ownership by Women

The results show a negative association of assets own by women and the risk of the child being not malnourished. Children's malnutrition can be handled if there is economic empowerment of women. She can spend more freely her resources on medication, food, and other luxuries for her child and meet requirements. The outcomes of the analysis are in accord with (Khan et al., 2019; Menon et al., 2018).

## Conclusion

The results of this study reveal that malnutrition is positively associated with the age of the child (in months), mother's employment status, mother's BMI, and incidence of diseases like diarrhea in children lately. The findings suggest that there is an inverse relationship of mother's education, assets owned by mothers, tetanus vaccination of mothers as well as wealth status of households with malnutrition and it is essential that women education should be encouraged at all levels. In most of the areas in Pakistan, girls have little or no freedom to education. The government should ensure the right to education for all and more especially should strictly enforce the working of

schools in rural areas. The official and non-official groups should launch income-generating departments for women in less developed regions with lucrative financial packages. The major causes of diarrheal and several infectious diseases are lack of mother education and awareness. It is direly needed to provide awareness about the importance of health programs and run health awareness programs to the common masses at the grassroots level. Poor nutrition is the cause of Low BMI of mothers. Poor nutrition also causes low birth weight babies as well as a high likelihood of undernourishment in infancy. Department of Health should ensure the maternal and child health, especially in early vaccination periods, it should be given priority. The prime focus should be on mothers' health. As results confirm that assets ownership by mother has a direct bearing on a child's nutritional status, hence women should be given property rights practically. Even today, women are discriminated against and are not given their due share of inheritance as per the law of the land. If due rights are provided to women, they will be strong and can take better care of their children. The study suggests that improvement in socio-economic conditions of households must be improved to bring about a positive turn in alleviating the child malnutrition.

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