**ORIGINAL ARTICLE**

# MATERNAL RISK FACTORS OF COEXISTED SEVERE ACUTE AND CHRONIC MALNUTRITION IN CHILDREN OF AGE 6 – 59 MONTHS

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## ABSTRACT

**Objectives:** Mothers' sociodemographic characteristics, nutrition status and food diversity are important determinants of acute and chronic malnutrition in children less than five years. Therefore, the study aimed to explore the maternal characteristics as risk factors of coexisted severe acute and chronic malnutrition in children of age 6 – 59 months.

**Methods**: The cross-sectional analytical study included children (n=70) who attended the hospital for wasting during September 2022 to February 2023 and their mothers (n=70). Using the WHO child growth standards, children were categorized into moderately and severely wasted, stunted and underweight. Crosstabs analyses and binary logistic regression performed to assess maternal characteristics as risk factors of acute and chronic malnutrition in children.

**Results**: Mean age was 13.3±11.5 (range 6-42 months). The participation of males was higher than females (55.7 vs. 44.3%). The frequency of coexisted severe acute and chronic malnutrition was 71.4%. Young mothers [aOR = 2.299, 95% CI 0.670-7.891], working mothers [aOR = 3.638, 95% CI 0.369-35.895], mothers with no kitchen autonomy [aOR = 1.345, 95% CI 0.421-4.301] and mothers with inadequate food diversity [aOR = 1.301, 95% CI 0.296-5.722] had higher risk of coexisted severe acute and chronic malnutrition in children.

**Conclusions:** The children who attended the hospital for wasting also had a high burden of stunting. Mothers' young age, working status, no autonomy and inadequate food diversity demonstrated higher risk of coexisted severe acute and chronic malnutrition in children.

**Key-Words:** Growth Disorders, Malnutrition, Nutritional Status, Risk Factors, Pakistan.

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## INTRODUCTION

Malnutrition is an important cause of mortality and disability in children. Globally about 45 million children suffer from severe malnutrition.[1] According to the National Nutritional Survey 2018, 40.2% children of age less than five years were stunted, 17.7% were wasted and 28.9% were underweight in Pakistan.[2] Studies have shown that early childhood malnourishment has severe and irreversible consequences with long lasting implications in later life. Undernourished children remain at risk of vicious cycle of recurrent infection and malnutrition, face learning disabilities, remain unable to realize their full potentials, therefore, contributes less to economic development.[3] Child undernutrition is largely preventable, though it is quite difficult to control as multiple factors are responsible for it.[2] These factors act at different levels, are usually interrelated, complex, and multidimensional. It is evident that early childhood is important for shaping life style of the child and early interventions help in preventing malnutrition and non-communicable diseases later in life.[4-6]

It has been shown that sociodemographic, health, environmental and biologic determinants of both the mother and child affect the nutritional status of a child.[3] Among maternal characteristics, mothers' education, sociodemographic, nutritional status, food choices and health profiles are important determinants of

malnutrition in children.[4] Dietary diversity (DD) which is defined as the number of various food groups ingested over a certain period of time, helps as an alternate indicator for nutrient adequacy in mothers and children's diets.[7] It is evident that if a mother consumes more food groups, it is more likely her children will have diversified food intake.[8-10] It has also been observed that dietary habits, food preferences of parents, and their attitudes determine a child's lifestyle, dietary habits and nutritional status.[11] A study conducted in south Punjab, has shown that maternal nutritional and health awareness strongly contribute to child malnutrition especially in marginalized community.[12]

In Pakistan, where mothers have the primary responsibility for looking after their children, it is important to understand the influence of maternal characteristics on child nutrition and health as it helps in addressing the problem of malnutrition. This study examined the role of maternal characteristics especially her food group consumption on nutritional status of children measured by stunting, wasting and underweight. The information from this study will help in designing possible intervention strategies to improve modifiable factors and food choices of families, which affect the nutritional status of mother as well as her family. It will indirectly benefit the nutritional status of children.

## METHODS

The cross-sectional analytical study included children (n=70) who attended the hospital for wasting during September 2022 to February 2023 and their mothers (n=70) using purposive sampling technique. The inclusion criteria were children with wasting, aged 6 – 59 months of any gender and his/ her mother. A child having any comorbidity was excluded from the study. The sample size was calculated using the expected rate of acute malnutrition 17.7% among children of age less than five years,[2] 95.0% confidence level and 8.0% margin of error.

**Operational definitions:** According to the World Health Organization (WHO) child growth standards, a child presenting with weight-for-height Z score (WHZ) less than –2.0 SD was defined as moderately wasted and WHZ less than –3.0 SD as severely wasted. Likewise, a child presenting with height-for-age Z score (HAZ) less than –2.0 SD was defined as moderately stunted and HAZ less than –3.0 SD as severely stunted. A child presenting with weight for age Z score (WAZ) less than –2.0 SD was defined as moderately underweight and WAZ less than –3.0 SD as severely underweight.[13] A child presenting with both severely stunted and severely wasted was considered as coexisted severe acute and chronic malnutrition. The nutritional status of mothers was assessed using body mass index (BMI) classification by the WHO: underweight < 18.5, normal weight 18.5 – 24.9, overweight 25.0 – 29.9, and obese ≥ 30.0 Kg/m$^2$.[14]

All data were collected upon enrollment in the study. The characteristics of an index child including age, sex, height, weight and mid upper arm circumference (MUAC) were noted and WHZ, HAZ and WAZ were calculated according to the WHO child growth standards. The characteristics of the mother of the indexed child including sociodemographic, anthropometric and dietary history were noted. Mother's age was categorized into ≤ 25 and > 25 years; family income was categorized into ≤ 25000 and > 25000 PKR/ month; BMI was categorized into < 25.0 and ≥ 25.0 Kg/m$^2$; and MUAC was categorized into ≥ 23 and < 23 cm. Dietary information was collected using dietary diversity questionnaire using 24 hours recall methods. Women consuming less than 5 food groups were labelled as having inadequate dietary diversity. Mothers who received kitchen budget and were able to decide what to cook, made purchases of food items or cook food themselves were having kitchen autonomy.

Statistical Package for Social Sciences (SPSS) version 26.0 used for data entry and analysis. The quantitative variables including age, income, height, weight and MUAC reported using mean ± standard deviation. The qualitative variables including gender, education, residence and undernutrition status reported using number (percent). Crosstabs analysis performed to compute odds ratio (OR) with 95% confidence interval. Binary logistic regression analysis performed to compute adjusted odds ratio (aOR) with 95% confidence interval. The covariates included mothers' age, education, occupation, family income, BMI, MUAC, kitchen autonomy and dietary diversity and the dependent variable was coexisted severe acute and chronic malnutrition.

## RESULTS

The age of children with wasting (n=70) ranged between 06 and 42 months. As shown in table 1, the participation of males (55.7%) and age-group 6-12 months (62.9%) was higher than others. The frequency of severely wasted females was slightly higher than males (90.3% vs. 87.2%). Oppositely, the frequency of severely stunted females was slightly lower than males (77.4% vs. 82.1%). However, the coexisted severe acute and chronic malnutrition was equally distributed between the two genders (71.0% vs. 71.8%).

The age of mothers (n=70) of wasted children ranged between 18 and 35 years. The frequency of sociodemographic characteristics included poor 100.0%, urban resident 100.0%, illiterate 50.0%, working 10.0%, single (divorced) 1.4%, don't drink milk 58.6%, don't eat fruits 28.6%, eat junk food 58.0%, one meal a day 4.3%, two meals a day 37.1%, and inadequate dietary intake 78.6%. Others including anthropometric measurements, kitchen autonomy and obstetric characteristics are shown in table 2. The frequency of children having coexisted severe acute and chronic malnutrition was 50(71.4%). Others included severe wasting with moderate stunting 12(17.1%), moderate

wasting with severe stunting 06(8.6%), and moderate wasting with moderate stunting 02(2.9%). Crosstabs analyses showed that young mothers [OR = 2.357, 95% CI 0.742-7.489], working mothers [OR = 2.591, 95% CI 0.292-23.019], and mothers with no kitchen autonomy [OR = 1.556, 95% CI 0.528-4.580] had higher risk of coexisted severe acute and chronic malnutrition. Binary logistic regression analyses also showed that young mothers [aOR = 2.299, 95% CI 0.670-7.891], working mothers [aOR = 3.638, 95% CI 0.369-35.895], mothers with no kitchen autonomy [aOR = 1.345, 95% CI 0.421-4.301] and mothers with inadequate food diversity [aOR = 1.301, 95% CI 0.296-5.722] had higher risk of coexisted severe acute and chronic malnutrition, see table 3.

Table 1. Characteristics of children with wasting (n=70)

| | | Count | Column % | Mean | SD |
|---|---|---|---|---|---|
| Sex | Male | 39 | 55.7 | | |
| | Female | 31 | 44.3 | | |
| | | | | 13.3 | 11.5 |
| Age (months) | 6 – 12 | 44 | 62.9 | | |
| | 13 – 24 | 22 | 31.4 | | |
| | > 24 | 04 | 5.7 | | |
| Weight (Kg) | | | | 5.0 | 1.6 |
| Height (cm) | | | | 64.9 | 8.3 |
| Wasted | < −3 SD | 62 | 88.6 | | |
| | < −2 SD | 08 | 11.4 | | |
| Stunted | < −3 SD | 56 | 80.0 | | |
| | < −2 SD | 14 | 20.0 | | |
| Underweight | < −3 SD | 66 | 94.3 | | |
| | < −2 SD | 04 | 5.7 | | |
| | | | | 10.9 | 5.4 |
| MUAC (cm) | < 11.5 | 60 | 85.7 | | |
| | ≥ 11.5 | 10 | 14.3 | | |
| Coexisted severe Acute & Chronic Malnutrition | Yes | 50 | 71.4 | | |
| | Others | 20 | 28.6 | | |

Table 2. Characteristics of mothers of children with wasting (n=70)

| | | Count | % | Mean | SD |
|---|---|---|---|---|---|
| | | | | 27.4 | 4.7 |
| **Age (years)** | ≤ 25 | 27 | 38.6 | | |
| | > 25 | 43 | 61.4 | | |
| **Education** | Illiterate | 35 | 50.0 | | |
| | Literate | 35 | 50.0 | | |
| **Occupation** | Working | 07 | 10.0 | | |
| | Housewife | 63 | 90.0 | | |
| | | | | 21868.6 | 9529.4 |
| **Family income (PKR/month)** | ≤ 25000 | 40 | 57.1 | | |
| | > 25000 | 30 | 42.9 | | |
| **Family type** | Joint | 54 | 77.1 | | |
| | Nuclear | 16 | 22.9 | | |
| **Family members/ house** | > 05 | 47 | 67.1 | | |
| | ≤ 05 | 23 | 32.9 | | |
| | | | | 25.2 | 5.4 |
| **BMI (Kg/m$^2$)** | < 18.5 | 09 | 12.9 | | |
| | 18.5-24.9 | 23 | 32.9 | | |
| | 25.0-29.9 | 25 | 35.7 | | |
| | ≥ 30.0 | 13 | 18.6 | | |
| | | | | 27.3 | 5.0 |
| **MUAC (cm)** | < 23 | 07 | 10.0 | | |
| | ≥ 23 | 63 | 90.0 | | |
| **Follow meal timing** | No | 29 | 41.4 | | |
| | Yes | 41 | 58.6 | | |
| **Get kitchen budget** | No | 34 | 48.6 | | |
| | Yes | 36 | 51.4 | | |
| **Who decides what to cook** | Self | 22 | 31.4 | | |
| | Mother-in-law | 34 | 48.6 | | |
| | Husband | 12 | 17.1 | | |
| | Children | 01 | 1.4 | | |
| | All above | 01 | 1.4 | | |
| **Who prepares food** | Self | 39 | 55.7 | | |
| | Mother-in-law | 31 | 44.3 | | |
| **Who purchase food items** | Self | 12 | 17.1 | | |
| | Husband | 37 | 52.9 | | |
| | Mother-in-law | 20 | 28.6 | | |
| | Father-in-law | 01 | 1.4 | | |
| **Dietary diversity** | Inadequate | 55 | 78.6 | | |
| | Adequate | 15 | 21.4 | | |

## DISCUSSION

Early childhood malnourishment has severe and irreversible consequences with long lasting implications in later life.[3] Globally estimated 170 million children aged <5 years are moderately or severely stunted; and 110 million are moderately or severely underweight.[16] Maternal education, household socioeconomic status, lack of knowledge about nutrition, micronutrient intake, food insecurity, poor sanitation, parity, birth spacing, low birth weight, inappropriate breastfeeding and complementary feeding are the contributing factors of childhood malnutrition.[17,18] Therefore, the purpose of present study was to explore the maternal characteristics as risk factors of coexisted severe acute and chronic malnutrition in children of age 6 – 59 months. In the present study, the children who attended the hospital for wasting had a high burden of stunting and underweight. In addition, the maternal characteristics including young age, working status, no autonomy and inadequate food diversity demonstrated higher risk of coexisted severe acute and chronic malnutrition. Overall, these findings are consistent with the results reported in several other studies that maternal characteristics contribute to the childhood malnutrition.[19-26]

In the present study, gender-wise distribution showed that female children had a slightly higher frequency of severely wasted (90.3% vs. 87.2%) and slightly lower frequency of severely stunted (77.4% vs. 82.1%) as compared to the male children. However, the coexisted severe acute and chronic malnutrition was equally distri-

Table 3. Mothers' characteristics as risk factors of coexisted severe acute and chronic malnutrition

| | | Coexisted severe acute and chronic malnutrition | | | | | |
|---|---|---|---|---|---|---|---|
| | | Yes (n=50) | | No (n=20) | | | |
| | | Count | Row % | Count | Row % | OR (95% CI) | aOR (95% CI) |
| **Age (years)** | ≤ 25 | 22 | 81.5 | 05 | 18.5 | 2.357 (0.742-7.489) | 2.299 (0.670-7.891) |
| | > 25 | 28 | 65.1 | 15 | 34.9 | | |
| **Education status** | Illiterate | 23 | 65.7 | 12 | 34.3 | 0.568 (0.198-1.628) | 0.536 (0.153-1.874) |
| | Literate | 27 | 77.1 | 08 | 22.9 | | |
| **Occupation** | Working | 06 | 85.7 | 01 | 14.3 | 2.591 (0.292-23.019) | 3.638 (0.369-35.895) |
| | Housewife | 44 | 69.8 | 19 | 30.2 | | |
| **Family income (PKR)** | ≤ 25000 | 29 | 72.5 | 11 | 27.5 | 1.130 (0.397-3.212) | 1.038 (0.308-3.500) |
| | > 25000 | 21 | 70.0 | 09 | 30.0 | | |
| **BMI (Kg/m$^2$)** | ≥ 25.0 | 27 | 71.1 | 11 | 28.9 | 0.960 (0.339-2.722) | 1.016 (0.259-3.994) |
| | < 25.0 | 23 | 71.9 | 09 | 28.1 | | |
| **MUAC (cm)** | < 23.0 | 05 | 71.4 | 02 | 28.6 | 1.000 (0.178-5.632) | 1.034 (0.136-7.846) |
| | ≥ 23.0 | 45 | 71.4 | 18 | 28.6 | | |
| **Kitchen autonomy** | No | 35 | 74.5 | 12 | 25.5 | 1.556 (0.528-4.580) | 1.345 (0.421-4.301) |
| | Yes | 15 | 65.2 | 08 | 34.8 | | |
| **Dietary diversity** | Inadequate | 39 | 70.9 | 16 | 29.1 | 0.886 (0.246-3.200) | 1.301 (0.296-5.722) |
| | Adequate | 11 | 73.3 | 04 | 26.7 | | |

buted between the two genders (71.0% vs. 71.8%). Similarly, Shahid et al. reported that both male and female children had a greater chance of being malnourished, but more effects had been observed in male children than female counterparts.[19]

The present study showed that illiterate mothers [aOR = 0.53, 95% CI 0.15-1.87] had a low risk of coexisted severe acute and chronic malnutrition. Whereas, Dessie et al. reported that mothers with no education [aOR = 1.6, 95% CI 1.3-2.0) or primary education [aOR = 1.4, 95% CI 1.1-1.8] had higher risk of stunting in children.[20] In a different way, Nsiah-Asamoah et al. also reported that mothers with secondary or above level of education [aOR = 0.6, 95% CI 0.4-0.9] had a reduced risk of stunting and underweight in children aged 06-23 months.[21]

Khan et al. reported that 20.0 % mothers of severely malnourished children were underweight, 42.0 % were normal weight, and 38.0 % were overweight and obese.[22] A similar distribution of double malnutrition was observed in the present study, where 12.9 % mothers of malnourished children were underweight, 32.9 % were normal weight, 35.7 % were overweight and 18.6 % were obese. Though, the mother's nutritional status didn't show any risk of coexisted severe malnutrition in the present study. However, Dessie et al. reported that underweight mothers had a higher risk of stunting [aOR = 1.6, 95% CI 1.3-2.0) and wasting [aOR = 2.3, 95% CI 1.7-3.4).[20] Similarly, Kailash et al. reported that majority of mothers of malnourished children were underweight.[23] Rachana et al. also reported that mothers of malnourished children were underweight, stunted and anaemic.[24]

Jamal et al. reported that mothers' empowerment is more important than their health and household poverty in determining nutritional status of children.[25] Nsiah-Asamoah et al. reported that mothers with financial autonomy were more likely to have diversified foods [aOR = 1.6, 95% CI 1.0-2.4]; and employed mothers [aOR = 0.7, 95% CI 0.5-1.1] had a reduced risk of underweight and stunting in children aged 06–23 months.[21] Shahid et al. also reported that working mothers, mothers without assets, and not involved in financial decisions were contributors of malnutrition in male children.[19] Differently, Paul et al. reported that maternal autonomy had a statistically insignificant relationship with stunting [OR = 0.9, 95% CI 0.8-1.0] and wasting [OR = 0.9, 95% CI 0.8-1.0] in children aged 0–59 months.[26] In agreement with these studies, the present study also demonstrated that that young mothers [aOR = 2.29, 95% CI 0.67-7.89], working mothers [aOR = 3.64, 95% CI 0.37-35.89], mothers with no kitchen autonomy [aOR = 1.35, 95% CI 0.42-4.30] and mothers with inadequate food diversity [aOR = 1.30, 95% CI 0.29-5.72] had higher risk of coexisted severe acute and chronic malnutrition in children aged 06–59 months.

## CONCLUSION

The children who attended the hospital for wasting also had a high burden of stunting. Mothers' young age, working status, no autonomy and inadequate food diversity demonstrated higher risk of coexisted severe acute and chronic malnutrition.

**Limitations of the study:** The limitations of the study include single-centre study, smaller sample size, and without control group.

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## AUTHOR’S CONTRIBUTIONS

**RK:** Conceived, designed and supervised the study
**MA:** Manuscript writing, Data collection, data analysis
**MM:** Data collection, entry, interpretation