

## Is there any Association between Child Temperament and Nutritional Status of Children? Evidences from a Study in a District of Gujarat, India

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### Abstract

Increasing number of undernourished children has been a great concern all over the world and India is also not excluded from this current alarming drift. Although, there found to be many factors associated with the nutritional risk among children but individual child behaviour known as temperament, their effect cannot be denied while examining the nutritional risk among children. As previous studies especially in developed countries found a significant association between these behavioural aspects and nutritional risk among children. With this backdrop, the objective of this study is to examine the association between child temperament with nutritional risk among children aged 3 - 6 years in urban Vadodara. To examine these associations, a cross sectional study was conducted among 472 children. Information was collected on behavioural aspects by using a set of scales which was validated and modified according to the context of the study area. Inferential statistics, bivariate, tri-variate analysis were carried to analyse the association between behavioural aspects and nutritional risk among children. Results suggested that, after controlling for potential predictors children with high intensity, sadness and angry behaviour are more likely to be at nutritional risk. The present study has provided evidences on the association between child temperament with nutritional risk among children, however, limitations relate to its cross-sectional nature, which requires caution in regard to causal inferences whether different behavioural aspects preceded or followed the development of undernutrition among children.

**Keywords:** *Nutrition; Child Temperament; Stunting; Wasting; Underweight; Well-Being*

### Introduction

The world is facing a grave nutritional situation with 155 children as stunted and 52 million children as wasted [1]. India is also not intact from this serious crisis. Although economically India may well be 'shining' to the world at large but when it comes to health, particularly child health, the picture is far from glossy. The recent data indicates that, currently 38 percent of children under five years of age are stunted, 21 percent wasted and 36 percent are underweight [2]. A Lancet study claims that economic growth will automatically lead to declines in child undernutrition, if poor nutritional outcomes are a manifestation of the poverty of nations. Arranging individual-level data from 121 Demographic and Health Surveys, Vollmer and colleagues questions the, association between economic growth and reductions in stunting, underweight, or wasting [3]. This was not the first doubt raise by the researchers on the optimistic view to show the positive association between economic growth and anthropometric outcomes; indeed, even there are previous studies which presented the similar evidence in India and sub-Saharan Africa [4,5].

While studying the other aspects in terms of non-economic factors for causing undernutrition among children such as individual child behaviour characteristics known as temperament have been found to be associated with negative nutritional behaviour and outcomes in young children [6,7]. Temperament refers to constitutionally based, individual differences in reactivity and self-regulation [7]. Empirical evidence from developed countries have found infants with fussy-intense temperament to be associated with negative feeding behaviours

such as shorter duration of breastfeeding, longer duration of bottle feeding and parent reported feeding problems [8-10]. Children whose temperament is characterized by Negative Affectivity (discomfort, fear, anger/frustration, sadness and poor soothability) are more likely to be associated with high nutrition risk [11]. There also studies which linked the child temperament with overweight among children and found that children with externalizing temperament had higher odds of being overweight than children those who are internalizing [12]. A systematic review of relevant literature was conducted to investigate the associations between child temperament with nutritional risk among children and the findings revealed an association between the temperament traits of poor self-regulation, distress to limitations, low and high soothability, low negative affectivity and higher BMI in infants and preschool-aged children. Temperament traits difficult, distress to limitations, surgency/extraversion and emotionality were significantly associated with weight gain rates in infants [13].

Children make important contributions to their social interactions; therefore, characteristics of the child should be considered when examining the feeding environment [14]. Temperament plays an important role in the parent-child dynamic because parents may react differently to children who are more internally controlled as compared to those who are more reactive in their temperaments [15]. A recent study showed that children (aged 3 to 8 years) with more emotional temperaments were reported by their mothers to display more food avoidant eating [16]. Child temperament, negative affectivity, was directly related to parents' negative emotions, and directly and indirectly related to parents' perceptions of more problems in feeding their children [15]. Two motivational factors important to parent-child feeding are directly linked to child temperament and parent's emotions [17]. Children's negative emotions are associated with mothers' negative emotions as they relate to parent-child feeding interactions [18].

A study found that one of the main reasons for infant with failure to thrive is their apathetic and passive nature which become very ineffective in communicating with mother as a result mother mostly misinterpret the infant cues and needs, and this results in the perpetuation of a problematic infant-mother interaction. In their study, it is very clearly stated that behavioural responsiveness results into failure to thrive. Further, mother of infant with failure to thrive perceive their infants behaviourally difficult and describe them as fussy, demanding, not cuddly, highly variable in moods, and less socially attractive [19,20]. Infants having bad nutritional status are having more negative behaviours when interacting with their mothers, as compared with healthy infants [21]. A sub-group of infants with both acutely and chronically malnourished exhibited more negative behaviour than the remainder of the infants [22].

## **Objective**

The core objective of the study is to understand the association between child temperament with nutritional risk among children aged 3-6 years.

## **Material and Methods**

### **Study area and sample size**

Gujarat is one of the economically better off states of India. Despite of the rapid progress made by the state on the economics front the status of health is the matter of concern and also an issue of debate among academia and researchers. According to DLHS II (2002-04), 46 per cent of children were measured as underweight [23]. Keeping this in mind, the state of Gujarat is chosen for this study. The study was conducted in urban area of Vadodara. Vadodara district has consisted of total population 41,65,626 (Urban 20,65,771, Rural 20,99,855) i.e. 49 per cent in urban and 51 per cent in rural area. It was the third most populous district of Gujarat [24]. According to DLHS II, 51 per cent children under age five years were underweight [23]. Apart from these criteria, a few indicators which were quite close to that of Gujarat like, literacy rate of Vadodara was 79 per cent, which was same to that of Gujarat 79 per cent, sex ratio of Vadodara was 934 per 1000 males and Gujarat 918, proportion of urban population was 43 percent for Gujarat and 49 percent for Vadodara. The percentage of main female work force is 56 percent in Gujarat whereas it was 52 percent in Vadodara. So based on these statistics, Vadodara district found to be the most suitable district matching average state characteristics to find the reasons for the malnutrition among the children.

For the estimation of sample size, this study uses prevalence of underweight in urban Vadodara district among children aged under five years which was 34 per cent according to DLHS II (2002-04). The minimum estimated number of children for the study is found to be 584 by using prevalence based method. Women who had a surviving child aged between 2 - 6 years were the respondent of the study. If in any household in the selected area having woman with more than one child, then the youngest child was selected for the study. The data for this study has been collected from the month of August to November, 2014.

### Why children of age group 3-6 years were chosen for behavioural aspect of the study

To study the behavioural aspect we have taken child age from 3 - 6 years, the first and foremost reason behind taking this age group was that, this study deals with the behaviour aspects of the children which we can't assess for less than 3 years of age as mentioned in many previous literature as well. The second reason was that whatever damage happens to child's health happens up to age 2 years after that age health become quite stable; after that may be other components like behaviour aspect play significant role in defining their health specifically nutritional status. So with this idea we restrict to children 3 - 6 years of age group.

### Nutritional status of children

To assess nutritional status of children, interview schedule has provisions to collect the information on age, height and weight of the child. Further the nutritional status of the children was evaluated using age and sex specific values of height and weight from the National Centre for Health Statistics (NCHS) reference data. The indices of undernutrition such as stunting, underweight and wasting were calculated by Z-score using the reference values of height-for-age, weight-for-age and weight-for-height of NCHS standards, respectively. Z-scores were calculated following the standard formula:

$$Z\text{-score} = \frac{X - \text{Median of NCHS}}{\text{Standard deviation of NCHS}}$$

Where; X is a measured value for a child to a given type of nutritional measurement. Three Z-scores were calculated: height-for-age Z-score (HAZ), weight-for-age Z-score (WAZ) and weight-for height Z-score (WHZ). The following scheme was utilized to define undernutrition: Stunting: HAZ < -2, underweight: WAZ < -2 and wasting: WHZ < -2. Children with Z-score below -2 of any of the indices were considered to be undernourished. For calculation anthropometric measures, a software package based on NCHS database EP16 has been used.

We have considered only -2SD Z-scores; the children in the study population were not found to be severely malnourished (-3 SD Z-score) since very few cases were lied in the respective category for height-for- age, weight-for-height and weight-for-age for -3SD Z scores. Therefore, the Z-score below -2SD Z-score was only taken in to consideration for further analysis.

### Child temperament

Child temperament is one of the important components of the study and to capture this dimension was a challenging task. Child temperament in study refers to "biologically rooted individual's differences in behavioural dimensions such as reactivity and self-regulation" [25]. There are 13 types of activities that have been captured to study the level of child temperament among the surveyed children. This includes activity level, anger/frustration, approach, attentional focusing, discomfort, falling reactivity/soothability, fear, high intensity pleasure, impulsivity, inhibitory control, low intensity pleasure and shyness. To capture these dimensions of child temperament certain numbers of questions have been asked under specific temperament trait (14 dimensions) on a five point likert scale from 1 "never" to 5 "always" which has been modified in the context of the study area. Scale scores for the dimensions represent the mean score of all scale items applicable to the child during the last six months, as the best judged by the caregiver. There are items, which were converted scored before using them to calculate the final scale of scores. This was done by subtracting the numerical response given by the caregiver from 6. Thus, a caregiver response of 5 becomes 1, 4 becomes 2, 3 remains 3, 2 becomes 4, 1 becomes 5. The Cronbach's alpha value of the scale came out to be 0.6182 which implies good internal consistency in the variability of responses from the sampled respondents.

### Nutritional risk among children

To assess the nutritional risk among children we have created a combined variable that composite of all the three nutritional risk among children that is if children is wasted, underweighted or stunted were coded as "1" and else "0".

### Statistical tools, variables and data analysis

To fulfil the stated objective both descriptive and multivariate statistical tools depending on the nature of variable were used. Dependent variable in the study; to measure the nutritional risk all three measures of nutritional status of children namely stunting, wasting and underweight were used as a dependent variable. These are dichotomous variables; score '1' was given for each positive response (i.e. if child is not stunted, wasted and underweight) and '0' otherwise.

Independent variables; Education level of mother, maternal well-being, maternal nutritional knowledge, working status, current age of the mother, age of child, birth order, sex of the child, number of children, income of the household, type of family, religion and caste, education of husband and occupation of husband, sex of the child, age of the child, birth order. The behavioural variables i.e. temperament is continuous in nature. The data has been entered in CSpPro 5.0 and further analysed by using STATA 13.

**Results and Discussion**

**Level of child temperament and its association with nutritional status of children**

Child temperament sub-scales with different measures of nutritional status of children are presented in table 1. Mean and standard deviation are calculated and analysed across all nutritional indices. Children those who are stunted their mother reported their activity, positivity level lower as compare to others. On the other hand, stunted children scored higher in domains like negativity, high intensity and impulsivity than those who are not stunted. In case of underweight, children in high nutritional risk group scored higher mean in aspects like anger, high intensity, low intensity and sadness, whereas had lower means in activity, positivity than their respective counterparts. For wasting children with higher activity and positivity are less wasted, whereas those who scored more in the domains of anger, high intensity, sadness and lower intensity are more wasted than their respective counterparts.

Child temperament	Stunting		Wasting		Underweight	
	Stunted	Not stunted	Wasted	Not wasted	Underweighted	Not underweighted
Activity	2.98 (0.46)	3.32 (0.61)	3.03 (0.48)	3.13 (0.52)	3.00 (0.46)	3.32 (0.55)
Positive	3.11 (0.69)	3.47 (0.76)	3.16 (0.70)	3.17 (0.72)	3.13 (0.69)	3.42 (0.81)
Anger	3.27 (0.63)	3.07 (0.46)	3.11 (0.66)	3.10 (0.47)	3.22 (0.72)	3.09 (0.46)
High intensity	3.53 (0.95)	3.11 (0.72)	3.52 (0.84)	3.14 (0.76)	3.53 (0.94)	3.14 (0.75)
Impulsivity	3.30 (0.69)	3.07 (0.63)	3.22 (0.64)	3.13 (0.67)	3.31 (0.70)	3.08 (0.64)
Low intensity	3.43 (1.04)	3.10 (0.82)	3.35 (0.86)	3.13 (0.85)	3.59 (0.93)	3.09 (0.82)
Sadness	3.40 (0.82)	3.05 (0.65)	3.46 (0.78)	3.05 (0.67)	3.54 (0.83)	3.04 (0.65)

**Table 1:** Mean and standard deviation of selected maternal reports of child temperament taints within different nutritional groups among children aged 3-6 years.

**Results of multivariate analysis showing the effect of behavioural aspects on nutritional risk**

Table 2 shows the adjusted odds for different temperamental aspects with nutritional risk among children aged 3 - 6 years. There are two aspects of child temperament that are positive and negative aspects. Children those who were having more negative temperament were more likely to be at nutritional risks than those who did not. After controlling for all the potential predictors it came out that children those who were angrier are 1.45 times (P > 0.002; CI 0.92 - 2.28) higher at the risk of poor nutrition. High intensity (1.74; P > 0.001; CI: 1.27 - 2.38) and impulsivity (1.48; P > 0.039; CI 1.02 - 2.14), low intensity (1.24; P > 0.132; CI 0.94 - 1.65) and sadness (1.78, P > 0.002; CI 1.24 - 2.56) also enhanced likelihood of poor nutritional status. Children with a temperament that is consistent with positive affectivity are less likely to be at nutritional risk. Children displaying more of activity level had 24 percent lower odds to be in high nutritional risk. Positive trait lowers 11 percent odds to be children at nutritional risk. So we can summarize that children those who are having more negative in temperament are more like to be underweighted, wasted and stunted than those who are having positive temperament.

Child temperament	Odds ratio	P-value	Confidence interval		Significant covariates
Activity	0.76	0.002	0.16	2.80	Education of women, maternal well-being and religion
Positive	0.89	0.107	0.23	1.84	Education of women, maternal well-being, religion and age of the women
Anger	1.45	0.111	0.92	2.28	Education of women, maternal well-being and religion
High intensity	1.74	0.001	1.27	2.38	Education of women, maternal well-being and religion
Impulsivity	1.48	0.039	1.02	2.14	Education of women, maternal well-being and religion
Low intensity	1.24	0.132	0.94	1.65	Education of women, maternal well-being and religion
Sadness	1.78	0.002	1.24	2.56	Education of women, maternal well-being and religion

**Table 2:** Adjusted odds for nutritional risk among children with different potential predictors for children aged 3-6 years. Nutritional risk coded: 1 Underweight or stunted or wasted; 0 Not underweight, not stunted and not wasted; The following covariates were controlled: Education level of mother, maternal well-being, maternal nutritional knowledge, working status, current age of the mother, age of child, birth order, sex of the child, number of children, income of the household, type of family, religion and caste, education of husband and occupation of husband, sex of the child, age of the child, birth order.

## Discussion

There are number of studies which already establishes the socioeconomic and demographic reasons for the undernutrition among children. The present study is however unique to assess the behavioural reasons for causing undernutrition among children. Using a cross sectional data, this study identifies the important behavioural aspects which are important while understanding the reasons for undernutrition among children. The results depicted a distinct picture wherein children those who are having negative behavioural trait are more likely to be at nutritional risk than those who are having positive behavioural trait.

The findings of present are in accordance with the findings of existing studies conducted among developed and developing countries. We have shown differences in a wide range of maternal reported temperament traits among children those who are under different nutritional risk namely, stunted, wasted and underweight. Children those who are stunted their mean temperament found to be higher in anger, high intensity, impulsivity, low intensity and sadness as reported by mother than those children who are not stunted. In case of wasted mean score for high intensity, impulsivity, low intensity and sadness reported to be higher than their respective counterparts. And similar scenario found to be in case of underweighted children. This finding is supported by the study which showed that children those who are having more negative effectivity and higher effortful control are more likely to be at nutritional risk [26]. On the other hand, there is another side of the coin which talked about the effect of children nutritional status on their temperament. Study stated that undernourished children had different temperament traits than better-nourished children. After adjusting for significant covariates, they found that the undernourished children were less sociable, less attentive, more fearful and had more negative emotionality than their respective counterparts [27]. Similar association have been stated by a study where they found that the stunted children showed significantly more apathy, and less enthusiasm and variety in exploring, were less happy and more fussy [28]. There are studies which argues that children self-regulation which is one of the aspect of temperament is important for many aspects of their health and well-being. Children those who are having poor emotional regulation are having higher externalizing behaviour and lack of self-regulation among children tends in rapid weight gain and obesity [29].

These findings are similar with the study conducted among pre-school children where they found that children whose temperament is characterized by Negative Affectivity (discomfort, fear, anger/frustration, sadness and poor soothability) are more likely to be associated with high nutrition risk [30].

### Conclusion

As our study proposes an association between individual differences in child temperament with high nutritional risk in children and has identified this crucial dimension and bring out that trait of negative affectivity has an increased likelihood of high nutritional risk among children than those who are having positive traits. Therefore, the importance of non-socioeconomic predictors i.e. behavioural aspect cannot be ignored while examining the factors associated with nutritional status of children, as they are crucial for their mental growth as well.

### Limitation

The study has few limitations which need to be addressed. Limitations relate to its cross-sectional nature, which requires caution in regard to causal inferences. We cannot be certain from cross-sectional studies whether temperament differences preceded or followed the development of undernutrition among children. However, nutritional status of children shown a good correlation with different behavioural aspects, still further research is needed to investigate the association between nutrition risk and child temperament as they are reported by the parent which induces a certain level of ascertainment bias.

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### Conflict of Interest

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