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Nutritional Assessment Of Agrarian Children In Tirunelveli Corporation

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Abstract

The goal of this research report was to conduct formative research for development of a Nutrition intervention for the Scheduled Caste community. Pre-school aged children in Scheduled Caste are stunted and exhibit micronutrient deficiencies as evidenced by anthropometric and biochemical laboratory data. The traditional Urban Scheduled Caste diet may because for micronutrient deficiencies leading to stunted growth in preschool aged children. The variety in food intake is lacking and may have unintentionally created an unhealthy food environment for pre-school aged children in Scheduled Caste, Urban Scheduled Caste. The most impacted age range is when the children are between the ages of 1 and 3 years old. In food insecure homes, the food variety is much less available than is in families of food secure homes. Deficiencies and food insecurity exist concurrently creating an environment that is not conducive to adequate growth and development in preschool aged children. Nutrition Data System for Research (NDSR) a possible intervention for this population would include a series of classes offered on site at the Greater Tirunelveli Corporation Primary Health Center. The series would begin working with pregnant women in insuring proper nutrition during pregnancy and on the importance of exclusively breastfeeding for the first 6 months of life for new mothers. The next class in the series would focus on weaning and adequate supplemental nutrition during this critical period of growth. The final series of the classes would focus on pre-school aged child nutrition, the importance of variety and how to prepare food with a limited budget and availability. The series might even include a series on community gardening to grow fruits and Vegetables that may otherwise be out of the family budget.

Keywords: Under nutrition, nutrition intervention, stunting, and micronutrient deficiencies.

Introduction

Under-nutrition is characterized by an inadequate diet and frequent infections that lead to macro- and micro-nutrient deficiencies indirect factors leading to child under-nutrition are poverty and food security (United Nations. (2016). Millennium Development Goals Report 2016). These two factors are intangibly linked because poverty disables a household's ability to secure enough goods and services for a good quality of life (http://www.who.int/mediacentre/factsheets/fs330/en/). This in turn causes a family to lose their food security, or the ability to obtain adequate amounts of food to meet daily nutritional needs. Nutritional status is not only based upon the living conditions of the household and the individual, but is more directly based upon the dietary quality of the individual's food intake. Regardless, if a child has enough food to eat, the nutrient content of the food plays a critical role in the nutritional status (Patwari, A.K. (2016)). When inadequate nutrient-dense foods are unavailable, micronutrient deficiencies become more prevalent. While there are many nutrients of concern, iron and zinc are two specific micronutrients that can affect a child's growth and cognitive development (Olivares M., Pizarro F., Gaitan D. &Ruz M. (2015)).

Statement of the Problem

Zinc and iron deficiencies are linked to stunted growth in children five years and under. Limited intake of zinc and iron bearing foods is identified in young children in an urban Slum area of Greater Tirunelveli Corporation Anganwadi Children. If nothing is done to intervene in the nutrition status of these children, zinc and iron deficiency related to food insecurity will persist, growth and development will slow even further, and chronic health issues may emerge.

Purpose Statement

The purpose of this study was to examine dietary patterns associated with the nutritional deficiencies of iron and zinc among preschool aged children, one to five years old.

Objectives of the Study:

The research Objectives were

- To examine and describe young child (ages one to five) nutritional status asset relates to key nutrients associated with stunting and wasting.
- To determine what key macro- and micro-nutrient deficiencies (primarily iron and zinc) are associated with wasting and stunting.

Research Hypotheses

- There will be a deficiency in iron and zinc among preschool age children relative to WHO reference standards; School aged children of urban Slum Anganwadi Children with diarrhea are more likely to be zinc deficient and anemic than those without diarrhea.
- There will be no significant differences in the zinc and iron status of school aged children of Greater Tirunelveli Corporation Anganwadi Children who are food insecure compared to those who are food secure.
- Zinc deficiency and anemia would be related to growth and development delays in school-aged children in an urban slum community.

Limitations of the Study

- This study focused on a specific community within Greater Tirunelveli Corporation urban Slum Anganwadi Children, therefore the sample was limited to mothers visiting a clinic who were willing to have their child participate in the study.

- The study relied on self-reporting of food consumed by the child over a one week period.
- There was no lab for blood analysis in the Greater Tirunelveli Corporation Urban Slum Anganwadi so blood samples were transported to a nearest Metro Corporation Health Center lab; therefore, cost of analysis limited sample size.

Data Analysis

The data from the food recalls for each participant were entered into the Nutrition Data System for Research (NDSR) to identify nutrient intakes for comparison to growth parameters. After the nutrient analysis in the NDSR, macro- and micro- nutrient levels were retrieved to compare blood lab values to the micro- nutrients of concern. Data analysis included a comparison of nutritional and health status compared to food security and Z-scores of height-for-age. This investigation used the Statistical Analysis System (SAS) for a statistical comparison using Fisher's exact test, ANOVA, and Odds Likelihood Ratio tests of:

1. Dietary intake of zinc to serum levels
2. Dietary zinc to presence of diarrhea
3. Dietary iron to presence of diarrhea
4. HCT levels to presence of diarrhea
5. Dietary iron to presence of food insecurity
6. Serum levels of zinc to presence of food insecurity
7. HCT levels to presence of food insecurity
8. Serum levels of zinc to weight-for-age (WAZ) and height-for-age (HAZ) Z scores
9. HCT levels to WAZ and HAZ

The use of Z-scores to assess and monitor a population can show high deficits Indicating health and nutritional problems within the sample as well as the population as a whole.

Result and Discussions

Table No.1. Dietary Intake of Zinc to Serum Zinc levels

Dietary Zinc	**Serum Zinc**		
	Low	**Normal**	**High**

Low	5.97%	0%	0%
Normal	7.46%	0%	1.49%
High	80.60%	4.48%	0%
Fisher's Exact Test (df):4 p-value:0.20			

When using the DRIs set by an affluent country like the India compared to Urban Scheduled Caste it is important to remember that nutrition needs vary by environment and culture. Overall, children in the study reported an unbalanced diet. The reported diet does not meet recommendations of the Indian Heart Association guidelines for fatsor carbohydrates and exceeds recommendations for age specific caloric intake. During an observational visit to Scheduled Caste, it was observed that the children predominately walk throughout the community and appear highly active. Many children assist their parents around the home and therefore spend little time being sedentary so energy storages minimal. In a study by Greater Tirunelveli Corporation Urban Scheduled Caste people who's living in identified slum, the energy expenditure of children in developing nations was compared to children in an affluent country. Higher energy was expended in the developing nations related to a traditionally more active lifestyle.

Table No.2. Dietary Intake of Iron to HCT levels

Dietary Zinc	**HCT**		
	Low	**Normal**	**High**
Low	**10.45%**	**10.45%**	**0%**
Normal	**0%**	**11.94%**	**1.49%**
High	**22.39%**	**41.79%**	**1.49%**
Fisher's Exact Test (df):4 p-value:0.05			

Children maximized energy use without further nutritional deficiencies; therefore, this indicates that energy needs in developing countries may be increased as a result of the increased physical activity. The dietary analysis in Tables suggests the need for a nutrition intervention among this population of school-aged children in Urban Scheduled Caste related to an insufficient distribution of macronutrient intake.

Table No.3. Dietary Intake of Iron to Serum Zinc levels

Dietary Zinc	**Serum Zinc**		
	Low	**Normal**	**High**
Low	**19.40%**	**1.45%**	**0%**
Normal	**13.43%**	**0%**	**0%**
High	**61.19%**	**2.99%**	**1.49%**
Fisher's Exact Test (df):4 p-value:1.00			

Hypothesis 1 predicted that the dietary assessment of micronutrient intake would show deficiencies in both zinc and iron in school aged children in an Urban Scheduled Caste community. Who examined the double burden of under nutrition and overweight in Urban Scheduled Caste. After reviewing the dietary analysis of parent-reported intake all participants are consuming adequate amounts of both iron and zinc; yet, the participant's lab results contradict the reported intake. On average, participants in all age ranges were zinc deficient and participants between 1-3 years of age were identified as anemic. Potential explanations for this inaccuracy between intake and serum levels include series on community gardening to grow fruits and Vegetables that may otherwise be out of the family budget.

Table No.4. Dietary Zinc to Presence of Diarrhea

Dietary Zinc	**Diarrhea**		
	Yes	**No**	**Remarks**
Low	8.57%	3.13%	-
Normal	2.86%	15.63%	-
High	88.57%	81.25%	-
Fisher's Exact Test (df):2 p-value:0.15			

Over-estimation of intake during the parent-reported survey: identified that over-reporting was more prevalent in children with low a BMI. Those identified as over-reporters, claimed to eat higher quantities of meat, milk, and pastries than what was actually consumed. In the present study, over-estimation was observed and evidenced by the high rate of stunted participants.

Table No.5. Dietary Iron to Presence of Diarrhea

Dietary Iron	**Diarrhea**		
	Yes	**No**	**Remarks**

Low	22.86%	18.75%	-
Normal	20.00%	6.258%	-
High	57.14%	73.25%	-
Fisher's Exact Test (df):2 p-value:0.21			

Biological interference during nutrient absorption: The Urban Scheduled Caste diet consists of lentils/beans and rice. These food items are high phytate foods increasing the potential for inhibited absorption of dietary zinc and iron as the minerals create a phytate complex. This complex prevents bioavailability for adequate absorption. As absorption decreases, micronutrient deficiencies increase.

Table No.6. Serum levels of Zinc Presence of Diarrhea

Serum Zinc	**Diarrhea**		
	Yes	**No**	**Remarks**
Low	97.13%	90.63%	-
Normal	2.00%	6.258%	-
High	0%	3.13%	-
Fisher's Exact Test (df):2 p-value:0.41			

Inaccurate nutrient profiles in the dietary analysis software. The Nutrition Data Systems for Research (NDSR) is a validated dietary analysis program that includes 18,000 food items with preparation including over 300 Hispanic foods and the capabilities for a multi-pass methods or recall (University of Madras, 2014). Using the NDSR, the study had the reliability for analyzing the reported intake. However, the Hispanic foods within the software are not country specific creating a possible discrepancy in nutrient breakdown. They describe the similar properties of iron and zinc explaining how both have the affinity for the same transporters. Although not statistically significant, when participants in the present consumed high levels of dietary iron the hematocrit (HCT) levels generally fell within the normal limits. While HCT levels are more normal with high intake of dietary iron, an increased serum zinc deficiency was observed.

Table No.7. HCT levels to Presence of Diarrhea

HCT	Diarrhea

	Yes	No	Remarks
Low	31.43%	34.64%	-
Normal	65.71%	62.258%	-
High	2.86%	3.13%	-
Fisher's Exact Test (df):2	p-value:0.90		

Hypothesis 2 predicted that school aged children of urban Scheduled Caste with diarrhea were more likely to be zinc deficient and anemic than those children without diarrhea. Just over half of participants reported diarrhea within the month prior to the brigade's visit to Scheduled Caste. There was not an association observed between the presence of diarrhea with low levels of both dietary zinc and iron on zinc deficiency and anemia. Each episode of diarrhea in an individual causes mucosal damage and nutrient exhaustion; therefore, chronic diarrhea leads to reduced absorption and malnutrition. However, the duration of diarrhea was not assessed in this study.

Table No.8. Dietary Zinc presence of Food Insecurity

Dietary Zinc	Diarrhea		
	Yes	**No**	**Remarks**
Low	2.78%	9.68%	-
Normal	11.10%	6.22%	-
High	86.11%	83.13%	-
Fisher's Exact Test (df):2 p-value:0.46			

The WHO defines diarrhea as three or more loose stools per day. In the physical exam the caretaker was asked if their child had diarrhea present within the past month. The child may have had one day of diarrhea, which would not cause these micronutrient deficiencies. More specific information about the duration and frequency of the cases of diarrhea would provide better information for identifying an association between micronutrient deficiencies and cases of diarrhea.

Table No. 9. Dietary Iron presence of Food Insecurity

Dietary Iron	Food Insecurity		
	Yes	**No**	**Remarks**
Low	11.11%	39.68%	-

Normal	11.10%	16.22%	-
High	76.64%	53.13%	-
Fisher's Exact Test (df):2 p-value:0.06			

Hypothesis 3 posed there would be observable differences in the zinc and iron Status of school aged children of urban Scheduled Caste who are food secure when compared to those who are food insecure. The majority of the participants reported having difficulty buying food every month or almost every month. Based on the binary logistic model for food security, there is statistically significant association between food insecurity and low dietary iron and high dietary zinc intake. There is not an association between the serum lab values for HCT and zinc and food insecurity.

Table No. 10. Serum Levels of Zinc to presence of Food Insecurity

Serum Zinc	**Food Insecurity**		
	Yes	**No**	**Remarks**
Low	64.11%	93.68%	-
Normal	5.10%	6.22%	-
High	0%	3.13%	-
Fisher's Exact Test (df):2 p-value:0.78			

Based on the reported intake, the types of food consumed by the families who are considered food insecure were zinc-rich foods like legumes. The reported intake of food insecure participants revealed less iron-rich food consumption like meat and leafy greens. The typical Urban Scheduled Caste diet consists of a stew like food called fenestrate, meat, rice, and starchy vegetable like plantains. Fenestrate is commonly made with lentils or kidney beans. Both are legumes. This may account for the high consumption of dietary zinc. Many food insecure participants consumed less meat and leafy greens; therefore, this could be the reason for a lower dietary iron intake. As previously discussed, iron and zinc have similar physicochemical properties which may account for the similarities in foods with inhibitory effects on the absorption of both iron and zinc. Foods containing these nutrients were included in the dietary intake of the Urban Scheduled Caste families studied. Some of these food sources were beans, seafood (i.e. fish and shrimp), red meat, poultry, yogurt, and cheese.

Conclusion

The sample population participating in this study has open access to the Greater Tirunelveli Corporation Primary Health Center in their community. The clinic currently offers some health and wellness activities, but could also offer more programs directed toward nutrition and nutrition education. Using the results from this study, the Brigade could employ dietetic students to offer a nutrition intervention program during Brigade visit sand to teach clinic staff to continue with the program. This would allow healthcare professionals to then follow up with new lab and anthropometric data as an evaluative measure of program success.

Recommendations

A possible intervention for this population would include a series of classes offered on site at the Greater Tirunelveli Corporation Primary Health Center. The series would begin working with pregnant women in insuring proper nutrition during pregnancy and on the importance of exclusively breastfeeding for the first 6 months of life for new mothers. The next class in the series would focus on weaning and adequate supplemental nutrition during this critical period of growth. The final series of the classes would focus on pre-school aged child nutrition, the importance of variety and how to prepare food with a limited budget and availability. The series might even include a series on community gardening to grow fruits and Vegetables that may otherwise be out of the family budget.

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