ORIGINAL ARTICLE

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Assessment of Nutritional Status and Cognitive Performance in School Children of District Peshawar: Pakistan

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ABSTRACT

Objective: To assess the nutritional and cognitive status of primary school children of district Peshawar.

Worldwide, about 20 million children under the age of 5 years have severe acute malnutrition, most of whom live in South Asia. In South Asia, an estimated 38 percent of children under the age of five have chronic malnutrition. Research had found that malnutrition and demographic features has significant effects on cognitive performance of school-going children.

Methodology: This cross-sectional study was conducted from December 2018- March 2019. 200 children were selected conveniently, written consent was taken from the parents. Parents of 46 children refused participation in the survey. Data of 154 children was collected. Children of primary classes grade one to five and 6-12 years were included in the study. Those whose parents didn't give permission, sick or physically disabled, children aged less than 6 years and over 12 years were not included in the study. Demographic data was collected from the parents using a structured questionnaire. Anthropometric measures were recorded. Cognitive performance was tested using the Ravens Color Progressive Matrices (RCPM). The analysis was done using SPSS version 22.

Results: Out of 200 selected, parents of n=153 children agreed to participate in the survey. Total 18.2% (28) had a normal BMI, 14.3% (22) were found obese, 14.3% (22) were overweight, 20% (31) children were stunted, and 55.8% (86) children were underweight, 39.6 (61) children had thinness, while 13.6 (21) were suffering from severe Thinness. Result of Ravens showed that 19.5% (30) students scored in 5th percentile, 22.7% (35) in 10th percentile, 21.4% (33) in 25th percentile, 26.6% (41) in 50th percentile, 9.1% (14) in 75 percentile while 0.6% (1) in 90th percentile. Cognitive status of 9.7% (15) students was "Above average", 26.6% (41) "Intellectually average", 44.2% (68) "Below average" while 19.5% (30) students was "Intellectually impaired". No child scored in "intellectually superior" category. A significant correlation was observed between Raven's test and age (p-value <0·01), weight. (p-value <0·05) based on Z-scores.

Conclusion: Children in Primary schools were cognitively found below average. A considerable number of children were suffering from malnutrition.

Keywords: Ravens, cognitive, malnutrition, Primary school children, Pakistan

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INTRODUCTION

Nutritional status is an important component of Primary Health Care (PHC), one of the goals of Sustainable Development Goals (SDGs)[1] and a contributor to the socioeconomic inequalities (up to 66%).[2,3,4] Worldwide, about 20 million children worldwide under the age of 5 years have severe acute malnutrition, most of whom live in South Asia, says the World Health Organization, and about one million die from the condition every year.[5] In South Asia, it was shown from different studies that 38 percent of children under the age of five are stunted due to chronic nutrition deprivation.[6] Timely detection of malnutrition could help prevent the deaths of hundreds of thousands of children, UN agencies say.[7] In countries experiencing the nutrition transition, overweight and obesity are increasing problems.[8]

Malnutrition contribute to about half of the 740,000 child

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deaths that occur every year in Pakistan.[9] Research has constantly found protein-energy malnutrition, iodine deficiency and iron-deficiency anemia to have significant adverse effects on tests of cognition in both pre-school and school-age children, and on attendance.[10] Due to illiteracy and poverty, health indicators are also low in Pakistan. Peshawar district has 24, 991 Primary, 4, 92 Secondary, and 3,774 High Schools operating in the district; 43% of its population is below the age of 15year.[11] Few comprehensive studies have been conducted to assess the nutritional status of primary school children in KPK Province, Pakistan. The aim of this study was to have an insight of nutritional status impact on cognitive abilities of the children at primary schools of Peshawar.

METHODOLOGY

This cross-sectional study was conducted from December 2018- March 2019 on Primary school children of Peshawar. Two public and two private schools were selected. Sample size was 200 with confidence level of 95%. Ethical clearance, administrative permissions and informed consent from schools and parents were taken before data collection. Parents of 46 children refused participation. Convenient sampling technique was used to collect data from 154 students. Primary school children from 1st to 5th classes (6-12 years) were included in the survey. Children having examination or absent were excluded from the study. Demographic information was collected using structured questionnaires from the parents. Cognitive status of the children was estimated "Raven's Colored Progressive Matrices 1998 edition", which is used to determine the cognitive abilities globally. RCPM have 36 problems, each with further three segments i.e. A, Ab, and B. It is a nonverbal test; questions were presented in geometrical design, with a missing section. The children were supposed to select one cell from the six choices given, children were given a test form and requested to answer every problem. Guidelines given in the matrices manual were followed. Test was taken in class room environment, 30-minutes were given to the children to complete the test. Data collected was converted to percentiles, and was assessed for overall scores. Standard criteria was used for grading RCPM scores i.e. Grade I: "Intellectually superior," for a score at or above the 95th percentile, for the age, Grade II: "Definitely above the average in intellectual capacity," if a score lies at or above the 75th percentile, Grade III: "Intellectually average," if a score lies between the 25th and 75th percentiles, Grade IV: "Definitely below average in intellectual capacity" if a score lies at or below the 25th percentile, Grade V: "Intellectually impaired," if a score lies at or below the 5th percentile for that age group. Anthropometry was done by WHO-recommended MUAC standard measuring tapes provided by UNICEF. [(1)] Children were measured in ordinary indoor clothing, but without footwear; heights were recorded to the nearest centimeter, and weights in kilograms to the nearest decimal. Weight was measured using weighting scale after zero error correction after removal of shoes and extra clothing. Subsequently, Anthropometric measures were taken from. Height was measured in a standing position using a height meters mounted against a wooden board wall to the nearest of 0.1 cm with detachable sliding head piece which is designed by the United Nations Children's Fund (UNICEF). Measurements were taken with the children standing barefooted and shoulders erect with their back of heels, buttocks and head touching the wall. Height was calculated using standard steel stadiometer from the children in centimeters, which was later converted to meters square to calculate BMI, weight (Kilograms) and MUAC (centimeters). Data was analyzed using SPSS 22.

RESULTS

Out of 200 selected children, n=153 were included in the survey (response rate 77%) after approval from their parents. Two public and two private sector schools were included in the survey. 84 (54.5%) children from Public sector while 70(45.55%) children from private sector were included in the study. 77 (50%) male as well as 77(50%) female children participated in the survey. Mean age of the children was 8.8 ± 1.44 years. 68.8% (106) children belong to the age group of 6-9 while 31.2% (48) were in the age group of 10-12. Data regarding socio-economic status was collected. 11.0% (17) were "Poor", 85.7%(132) "Average" while 3.2%(5) were included in the "Rich" socio-economic status. Data about mother's education was collected. 20.1% (31) mothers were illiterate. 11.7% (18) had primary education, 2.6% (4) had middle education, 18.8% (29) did matriculate, 10.4% (16) did their intermediate, 14.3% (22) graduated while 22.1% (34) were Post Graduate. Ravens colored matrix results were converted to standard percentiles. Score of 19.5%(30) were included in 5 percentiles, 22.7%(35) in 10 percentiles, 21.4%(33) in 25 percentile, 26.6% (41) in 50 percentiles, 9.1%(14) in 75 percentile while 0.6%(1) were included in 90 percentile. Height of the children were calculated in centimeters. 2.6% (4) had a height including and between 101-110 cms, 5.8% (9) had a height between 111-120, 33.1% (51) between 121-

Table 1: Significant Correlations between Ravens, anthropometric & demographic factors (n=154)

Correlation between Ravens score & nutritional status		Ravens total score
Age	Pearson Correlation	-354
	Significance level	0.00
Weight	Pearson Correlation	-195
	Significance level	0.015
Mothers Education	Pearson Correlation	.174
	Significance level	.031

Table 2: Comparison of correlation between Ravens score & Nutritional Status

Correlation between Ravens score & nutritional status		Pearson R
Height	Public Sector	- 0.081
	Private Sector	0.311
Weight	Public Sector	0.428
	Private Sector	0.243
Mid Arm Circumference	Public Sector	0.257
	Private Sector	0.420

This table shows Pearson's Correlation between Anthropometric measures and Ravens test (school category wise).

130, 39.0% (60) between 131-140 while 19.5% (30) had height between 141-150. 131 cm was mean height of the children. Mean mid arm circumference for all children were 18 cm. Mean mid arm circumference of public school children was 17 cm where as private school children were 19.63 cm.

Significant correlations between Anthropometric Measurements, mothers education and Ravens scores is shown in table 1. Subsequently results of Ravens colored Matrix were compared with the Anthropometric measures to see the association. It was found that on the whole children with good anthropometric results had good scores of Ravens.

To check the correlation of height with Ravens test Pearson's R value was taken. It shows no correlation, by giving value of .081 for public sector, while for private it was 0.311.

Correlation of weight with Ravens test was taken. Its value for public sector was 0.243 which reflects positive correlation. While value for private was 0.428 which shows strong positive correlation.

Correlation with Mid arm circumference and Ravens colored Matrix for public sector was 0.257 while for private was 0.420, shows stronger correlation with private sector.

Descriptive statistics shows mean values of age 9.21, mean value for anthropometric measures Height (cms) 133.01, Weight (kg) 26.69 Mid Arm Circumference 18.29PA time Hours /week 1.2162 and mean of members in the family 8, and Ravens score was 19 out of 36. Age and Anthropometric measures of Private sector was compared with Public sector children and their significant P values.

DISCUSSION

Current study was conducted to determine the effect of nutritional status on cognition of primary school children in Public and private settings. Anthropometry including height, weight and mid arm circumference. Measurements were not compared with WHO standards of growth, rather anthropometric measures taken were directly and individually compared with Ravens results using Pearson's R test.

A similar study was conducted in Australia where the role of nutrition in children's neurocognitive development was observed. Study observed that children living in poor countries may run into more multiple nutritional deficits, imbalances and hence measurable neurocognitive deficiencies as compared to children living in developed countries. In developed countries trivial nutritional deficiencies may not effect cognition due to compensation over time. Result of the research was consistent with our study where children studying in public schools belonged to the salaried middle class strata and showed lower cognitive results as compared to private school children which belonged to business class mostly. [12]

Another study was conducted in India where effect of stunting was determine on cognitive outcomes in children. Study, used facts from three diverse nutritional intervention studies conducted over a 4-year time on school-age children in Bangalore to measure their relationships. Results of independent t-tests showed that stunted children had suggestively poorer performance on short-term memory, retrieval ability and visuospatial ability tests. There was no significant difference in cognitive scores following nutritional interventions over a 6-month period, between those who remained stunted and those who were no longer stunted. 13 The current study considered all the three variables of nutritional measurement (height, weight and mid upper arm circumference), similar to above observation stunted and underweight children showed less scores in Ravins cognitive test. Another similar study was conducted in 2002 in Sindh Pakistan, to examining the relationship between delayed psychomotor development, low birth weight and postnatal growth failure among urban and rural children in Pakistan. According to the study psychomotor

developments appeared to be mediated largely by nutritional status. However, unlike this study, current study mainly focused on effect of nutrition on cognition of school going children, other detail and complex relationships were not addressed.[14]

Current study was limited to only two schools of District Peshawar. In order to generalized the results more districts can be added to the study. Anthropometric measures were not compared with WHO standards.

CONCLUSION

Children in Primary schools were cognitively found below average. A considerable number of children were suffering from malnutrition

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