
Health Status of School Children in a Tribal Colony Near Bengaluru, Karnataka: A Cross Sectional Study

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Abstract

Background: Health of children plays an indispensable role in the development of the country. Nutrition and health of the tribal children continue to be a pressing concern in India. Biochemical and hematological examination of children is an essential tool for assessment of health status, early identification of preventable risk factors and for diagnosis of various diseases.

Objective: To assess the health status of Hakki Pikki tribal school children by evaluating the biochemical and haematological parameters.

Materials and Methods: This was a community based cross sectional study of 76(Boys-32 and Girls-44) Hakki Pikki tribal children studying at Government Higher Primary School, Hakki Pikki Colony, Gowripura, Bengaluru Karnataka, India. Biochemical and haematological parameters were determined in accordance with standard operating procedures followed by good laboratory practices.

Results: The study group consisted of children aged between 6 to 17 years, among them 32 students were males and 44 were females. 21(11-boys and 10-girls) children were under weight and 02 girls were overweight. The common ailments found were, dental carries (2.63%), ear discharge (2.63%), anaemia (3.94%), Impetigo (7.89%). Comparing between Boys and Girls less than or equal to 10 years of age there was a significant difference in Creatinine as p-value < 0.05. There was a significant difference in Creatinine, Uric acid, AST, ALT, total protein, albumin, HbA1C and Haemoglobin when comparing between Boys and Girls of age greater than 10 years p-value < 0.05. In these tribal children the distribution of biochemical and haematological parameters values considerably follows the reported reference values.

Conclusions: This study highlights a puzzling situation of health status among these Hakki Pikki tribal children due to apparent change in socio cultural, lifestyle, nutrition, and urbanization. Under weight has emanated as a solemn problem unless addressed.

Keywords: Blood Glucose, BMI, Calcium, Hakki-Pikki, Haemoglobin, HbA1c,

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Abbreviations: BMI-Body Mass Index, RBS-Random Blood Sugar, HbA1c-Glycated Haemoglobin, TB-Total Bilirubin, DB-Direct Bilirubin, AST-Aspartate amino transferase, ALT-Alanine amino transferase, ALP-Alkaline phosphatase, HDL-High density lipoprotein, LDL-Low density lipoprotein, VLDL-Very low density lipoprotein, WHO- World Health Organisation, EDTA- Ethylene diamine tetra acetic acid.

Introduction

In India 8.6% of the total population and 6.95 % of Karnataka's population represents tribal communities.^(1,2) The tribal population are under par to health care among various social categories in India. The Hakki Pikki tribal earlier living in forests, hunting animals and birds for their livelihood are one of the diminishing tribes in Karnataka.⁽³⁾ Children are vital assets of the society and they have intrinsic value in their own right.⁽⁴⁾ Nutrition and health of the tribal children continue to be a pressing concern in India.⁽⁵⁾ Higher rates of morbidity and mortality are witnessed among infants and mothers, also increasing childhood malnutrition has been reported in tribal population in recent years.⁽¹⁾

Age, sex, dietary intake, physiological state of the body and ethnicity considerably determines the biochemical parameter levels.⁽⁶⁾ Frequent problems faced during school age are repeated infections, malnutrition, dental caries, upper respiratory infections. Health condition of tribal school children may worsen due poor socioeconomic conditions.⁽⁷⁾

Biochemical parameters like blood glucose is used to assess diabetes, serum creatinine is used to assess renal function and detect chronic kidney disease, serum uric acid is useful to reveal hidden asymptomatic conditions including gout, malignant disorders, hereditary diseases, and elevated levels of HDL cholesterol and LDL cholesterol are frequently the first indicators of genetic dyslipidaemias, such as familial hypercholesterolemia.⁽⁸⁾ In India, there is dietary calcium deficiency across various age groups and gender coupled with vitamin D deficiency and rickets developing in children with low calcium intake.⁽⁹⁾ A deranged complete blood count often is the first clue of hematologic malignancies and anaemia.⁽⁷⁾

Clinical laboratory plays major role in providing valuable information regarding health and diseases of an individual. Biochemical tests and Complete Blood Count (CBC) are routinely used to assess health status, to diagnose and also to monitor diseases.⁽¹⁰⁾ There is

relative lack of research/ study on tribal Hakki Pikki children's health. With the above background, this study was carried out to assess the health status of tribal school children by evaluating the laboratory values in a tribal colony near Gowripura, Bengaluru, Karnataka, India.

Materials and Methods

A community based descriptive study carried out for a period of six months at Raja Rajeswari Medical College and Hospital, Bengaluru, India. and approved by the Institutional Ethics Committee (RRMCH-IEC/58//2022). Written informed consent from the school authority and parents was taken. The school was visited on preassigned day of each week. A good rapport was built up with the students and verbal consent was taken. Students were approached class wise and the following socio demographic details of the children were collected with respect to age, sex, class, followed by physical and systemic examination.

Study population

The Hakki Pikki tribal population, Gowripura, Bengaluru was 420, among them 97 were local school going children. Total of 76 children aged between 6 to 17 years, of which 32 children were males and 44 were females enrolled in the study and 21 students excluded as their parents were not willing to give consent.

Sample collection and Analysis

From the participants, venous blood sample was collected by trained phlebotomists in three different vacutainers - a clot activator tube, potassium EDTA (Ethylene diamine tetra acetic acid) tube and sodium fluoride tube. After ensuring proper sample labelling, samples were transported to the laboratory over ice pack for biochemical and hematological analysis. All biochemical investigations were carried out in accordance with standard operating procedures followed by good laboratory practices. Two levels of internal quality controls (IQC) from Bio-Rad

(Bio-Rad Laboratories) were run prior to the tests and interpreted in according to Westgard multirule algorithm and recorded as Levy Jennings graph. The following investigations including random blood sugar, renal function test, liver function test, lipid profile and serum calcium were measured using commercially available kits in well recognised robust automatic analyser Beckman Coulter Au480 Chemistry Analyser. HbA1c measured by Bio-Rad D10 analyzer by HPLC method. Complete Blood Count measured by Sysmex automated analyzer. Baseline characters height (cm) was measured by wall mounted height measuring scale (62cm to 200cm) and weighing scale (0kg to130kg) body mass index (BMI= kg/m²) for age were recorded for all participants.

Statistical Analysis

Data Collected was analysed using Descriptive and Inferential Statistics, using Statistical software

SPSS v20 and MS Excel. By Descriptive Statistics: data was summarised using following procedure like Distribution of Demographic data was expressed as frequency and percentages, continuous data was expressed as mean and standard deviation. By Inferential Statistics: To find association between the attributes the Chi-square test was used, to find the significant difference of demographic variables and lab results among two groups of the study t test unpaired was used, All the statistical analysis were carried out at 5% level of significance and a p-value < 0.05 was considered as significant.

Results

Total of 76 children included in the study, age of the children ranged from 6 to 17 years, of which majority of them 44 (57.89%) were female compared to 32 (42.1%) males.

Table 1: Demographic profile of study subjects

Variables	Males		Females		Total	
	n	%	n	%	N	%
06-10 years	11	14.47	18	26.68	29	38.15
11-17 years	21	27.63	26	34.21	47	61.84
Total	32	42.10	44	57.89	76	100

Table 2: Distribution of students according to BMI and Sex

Nutritional status	Males		Females		Total	
	n	%	n	%	n	%
Under weight	11	14.47	10	13.16	21	27.63
Normal weight	21	27.63	32	42.11	53	69.74
Over weight	0	0	02	2.63	2	2.63
Total	32	42.1	44	57.9	76	100

The BMI was calculated as the weight in kilograms divided by the square of their height in meters. To categorise a child as normal, underweight or overweight, the age and sex wise WHO BMI

chart with Z scores was referred⁽¹¹⁾. The BMI value within 2SD was considered normal, less than 2 SD as underweight and more than 2SD as overweight.

Table 3: The biochemical and haematological values for children ≤ 10 Years of age.

Laboratory Results	Range	Age≤ 10Years Boys [n=11]		Age≤10Years Girls [n=18]		p-value
		Mean	±SD	Mean	±SD	
RBS	80-140mg/ dl	81.0	17.6	73.9	8.2	0.1504
HbA1C	6%	5.1	6.0	5.0	3.5	0.337
UREA	18-45mg/ dl	20.7	0.1	17.5	0.1	0.0795

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Creatinine	0.5-1mg/dl	0.5	1.0	0.4	0.7	0.0145
Uric acid	2.5-7.7mg/dl	3.7	0.2	3.2	0.1	0.1245
TB	up to 1.2mg/dl	0.4	0.0	0.4	0.0	1.0000
DB	up to 0.4mg/dl	0.1	9.6	0.1	5.0	1.0000
AST	up to 46 U/L	31.2	7.6	25.8	4.9	0.0550
ALT	up to 49U/L	20.6	82.1	17.4	126.0	0.1777
ALP	up to 644 U/L	599.1	0.4	579.8	0.2	0.6555
TOTAL PROTEIN	6-8gm/dl	7.1	0.2	6.9	0.1	0.0511
ALBUMIN	3.5-5.5gm/dl	3.9	0.2	3.8	0.1	0.0833
MAGNECIUM	1.7- 2.3 mg/dl	2.2	0.4	2.2	0.4	1.0000
CALCIUM	8.50 - 10.50mg/dl	9.8	14.9	9.8	16.4	1.0000
Total Cholesterol	150-220 mg/dl	161.2	23.1	167.8	18.2	1.0000
HDL Cholesterol	35-80 mg/dl	52.1	18.1	49.5	16.6	0.7380
LDL Cholesterol	135mg/dl	89.0	16.9	99.2	12.6	0.1323
VLDL	10-35 mg/dl	29.8	83.8	28.4	63.0	0.8006
Triglycerides	60-165mg/dl	150.5	0.2	144.6	0.3	0.8307
HB	M 3-7gm%	13.8	1.1	13.6	0.7	0.553
	F 12- 5gm%					
RBC	M 4.5-5.5 mill/cumm	5.26	0.30	5.16	0.32	0.4108
	F 3.8-4.8 mill/cumm					
WBC	4000-11000 cells/cumm	8735.45	1883.75	8736.67	1628.36	0.9996
Platelets	1.5-4.0 lakhs/cumm	3.95	0.53	3.72	0.58	0.2944

Table 3: The biochemical and haematological values for children > 10 Years of age.

Laboratory Results	Range	Age > 10 Years Boys [n=21]		Age > 10 Years Girls [n=26]		p-value
		Mean	±SD	Mean	±SD	
RBS	80-140mg/dl	76.8	16.8	71.5	9.1	0.1080
HbA1c	6%	5.2	4.8	5.1	4.9	0.001
UREA	18-45mg/dl	18.8	0.2	17.0	0.1	0.2980
Creatinine	0.5-1mg/dl	0.6	1.4	0.5	0.8	0.0307
Uric acid	2.5-7.7mg/dl	4.5	0.2	3.6	0.2	0.0177
TB	up to 1.2mg/dl	0.4	0.0	0.4	0.0	0.0952
DB	up to 0.4mg/dl	0.1	6.1	0.1	5.3	1.0000
AST	up to 46 U/L	29.4	5.3	24.0	3.1	0.0358
ALT	up to 49U/L	18.4	186.8	14.0	190.4	0.0057
ALP	up to 644 U/L	551.0	0.2	505.5	0.4	0.2759
TOTAL PROTEIN	6-8gm/dl	7.2	0.1	7.0	0.1	0.0426
ALBUMIN	3.5-5.5gm/dl	3.9	0.1	3.8	0.1	0.0014
MAGNECIUM	1.7- 2.3 mg/dl	2.2	0.4	2.2	0.3	1.0000
CALCIUM	8.50 - 10.50mg/dl	9.7	19.7	9.6	20.6	0.0564
Total Cholesterol	150-220 mg/dl	173.8	9.2	165.0	9.4	0.1237
HDL Cholesterol	35-80 mg/dl	48.7	16.1	47.5	18.8	0.3843
LDL Cholesterol	135mg/dl	104.2	14.1	101.5	15.0	0.1894

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VLDL	10-35 mg/dl	32.0	71.0	26.5	74.9	0.9445
Triglycerides	60-165mg/dl	162.4	0.2	133.5	0.2	0.9225
Haemaglobin	M 13-17gm%	14.3	1.2	13.1	0.9	0.000
	F 12-15gm%					
RBC	M 4.5-5.5 mill/ cumm	5.98	2.06	5.02	0.38	0.0242
	F 3.8-4.8 mill/ cumm					
WBC	4000-11000 cells/ cumm	8515.71	2149.82	8885.38	1728.88	0.5166
Platelets	1.5-4.0 lakhs/ cumm	3.52	0.65	3.31	0.53	0.2286

There was significant difference in Creatinine, Uric acid, AST, ALT, total protein, albumin, HbA1C, HB and RBC as $P < 0.05$ among boys and girls.

Discussion

Tribal communities are geographically distinct; with each tribe having its own unique customs, traditions, beliefs and practices. Karnataka has a sizeable population of tribal people. The Hakki Pikki tribes, belongs to semi-nomadic group.⁽⁴⁾ Tribal populations are isolated from the general population by their own socio-economic and physical environment. Poverty, illiteracy, lack of environmental sanitation and hygiene, lack of safe water supply and lack of access to health services are some of the factors which contribute to the poor health status of tribal communities.⁽⁸⁾ These distinct tribal children need special attention because of their extra vulnerability to poor health.⁽¹²⁾

Children are the wealth of nation because they constitute one of the population's essential segments. School is a centre that plays a vital role in children's physical, social, mental, and emotional development.⁽⁹⁾ India accounts 40% population below the age of 18 years which accounts world largest child population.⁽¹³⁾

In view of this context, this study was undertaken to evaluate the biochemical and hematological parameter levels which is an essential tool for assessment of health status of children and early identification of preventable risk factors for and diagnosis of various diseases.

The study group consisted of children aged between 6 to 17 years, among them 32 students were males and 44 were females. 21(27.63%) children [10(13.16%) were girls and 11(14.47%) were boys] were underweight and 02 (2.63%) were overweight [02 (3.07%) were girls, none of the boys were overweight].

In this study underweight children were 27.63% which is comparable with the study done by Verma N et al. (26.8%) but better as compared with Maheshwaran et al. study(71%) conducted in Rural south India.^(9,14)

In spite of existing PM Poshan Yojana formerly called as Mid-Day Meal Scheme where in school children are supplemented with nutrition in the form of Mid-day meals as per the standards prescribed by Central Government, the problem of under nutrition is still prevailing in around one fourth of the school going children in our study. One of the goal of Mid-Day Meal Scheme, healthy mind in healthy body is still falling short from one fourth to three fourth of the total school going children in various locations of our country which needs to be addressed appropriately.⁽¹⁵⁾ Overweight prevalence in the present study was 2.63%, which contrasts with the Bhardwaj AK et al. study where the overweight prevalence was significantly higher in tribal population compared to the urban and rural population.⁽¹⁶⁾

In these tribal children the distribution of biochemical parameters such as Random Blood Sugar, HbA1c, UREA, Creatinine, Uric acid, Total Bilirubin, Direct Bilirubin, SGOT/AST, SGPT/ALT, ALP, Total Protein, Albumin, Total Cholesterol, HDL

Cholesterol, LDL Cholesterol, VLDL, Triglycerides values considerably follows the reported reference values. In this tribal school children, the mean serum Calcium and Magnesium levels were within the normal reference range. These children tend to consume milk and millets in the mid-day meal programme may tend to help in meeting the requirements of calcium and magnesium.

The parameters Comparing between Boys and Girls, less than or equal to 10 years of age group, there was a significant difference in Creatinine as p -value < 0.05. The values of biochemical parameters in Boys and Girls, greater than 10 years of age group there was a significant difference in Creatinine, Uric acid, SGOT/AST, SGPT/ALT, total protein, albumin, HbA1C, HB as p -value < 0.05. These parameters were high in boys similar to the Bandesh K et al., study.⁽¹⁶⁾ Age, sex, dietary intake, physiological state of the body and ethnicity considerably determines the biochemical parameter levels.⁽⁶⁾ Men have higher muscle mass than women throughout their life which corresponds to high creatinine levels.⁽¹⁷⁾

In this study group, we found anaemia in 3.94% of children which was lower than Verma N et al. (14.9%) in urban slums of Lucknow and Panda et al (26%) at Ludhiana city.⁽¹⁸⁾

These findings could be due to the effective implementation of supplementary nutritional (Mid-Day meal and iron supplementation) program.

There was no association with gender and haematological parameters in children below or equal to 10 years but significant difference of haemoglobin and RBC as p -value < 0.05 in children above 10 years that was in adolescents may be due to sex hormones.⁽¹⁹⁾

Conclusions

This study highlights a puzzling situation of health status among these Hakki Pikki tribal children due to apparent change in socio cultural, lifestyle, nutrition and urbanization. Under nutrition in school going children is still not resolved as per expectations even with existing operational government schemes to curtail the same. All other morbidities were less prevalent as compared to other parts of India. Thus, present study suggests to conduct continuous

health education in which school plays a vital role and effective surveillance to understand the complex interplay of associated factors. Therefore, continuous monitoring with periodic health check-up may help to control these morbidities for better health of the future generation and lessen the pocket of expenditure of the families. Need of the hour is continuous health education, creation of awareness and emphasis regarding health-related morbidities, personal hygiene and poor sanitary practices is essential among this special population school children.

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Strength, Limitation and Recommendation

A strength of the study is that samples used for the analysis were obtained from school children by direct approach and the results are felt to be representative of the children and adolescents of tribal population. The information can be for used for planning interventions trails in dietary habits at community level.

The limitation of the study was that only protocol defined routine biochemical and haematological parameters were measured. Iron Profile and vitamin D were not measured which would have strengthened our laboratory diagnosis.

Reccomendations

1. To conduct continuous health education in which school plays a vital role and effective surveillance to understand the complex interplay of associated factors.

2. To determine the extent and strength of the relation between dietary habits, overweight and the risk of type 2 diabetes mellitus among these children would be desirable.

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