Prevalence of Hypertension Among School Children in a Rural Area of Tamil Nadu

A cross-sectional study was conducted to measure the prevalence of hypertension among 310 rural school children in Tamil Nadu. The prevalence of hypertension and pre-hypertension was 10% and 14.2%, respectively. Prevalence was significantly higher among and private school students. We recommend that children should be screened for hypertension for early diagnosis and prevention of complications.

Keywords: *Adolescent, Epidemiology, Hypertension*.

High blood pressure (BP) in children has been considered as a potential risk factor for hypertension in adulthood. Blood pressure varies with age, sex and height in children; therefore the diagnosis is complicated and nearly 75% of hypertensive children remain undiagnosed [1]. This study determined the prevalence of hypertension and pre-hypertension among school children in a rural area of district Villupuram, Tamil Nadu.

This cross-sectional study was conducted among school children aged 11-15 years in 2013. Two schools (1 Government and 1 Private) were selected purposively, and all the students belonging to class VI to X were included. A total of 310 school children (173 boys and 137 girls) were interviewed and examined. Automated BP measuring apparatus (OMRON) was used. Hypertension was defined as average systolic BP and/or diastolic BP ≥95th percentile for gender, age, and height on ≥3 occasions. Pre-hypertension was defined as average SBP or DBP levels ≥90th percentile but < 95th percentile. Data was analyzed using SPSS version 17.0. Chi-square test was used for analysis and *P* value <0.05 was considered statistically significant. Institutional Ethics Committee clearance was obtained. Permission was obtained from school authorities and written consent from the parents. Assent was also obtained from the children.

Participants were equally distributed across the different age groups (data not shown). The overall prevalence of hypertension in our study participants was 10% and prevalence of pre-hypertension was 14.2%. There was significant difference in prevalence of hypertension between students of government or private school (***Table* I**).

The prevalence of hypertension in our study was higher as compared to some earlier studies from similar setting [2,3]. This could be due to different socio-demographic characteristics. The prevalence of pre-hypertension in our study was similar to that of study done by Rahman, *et al*. [3]. Increasing prevalence of hypertension might be due to childhood obesity as well as growing awareness of the diseases [3-6]. We suggest that children should be screened regularly for hypertension to

TABLE I DISTRIBUTION OF STUDY PARTICIPANTS, BASED ON SELECTED DETERMINANTS AND HYPERTENSION (*N*=310)

Determinants	*Hypertension, n (%)*	*Pre-hypertension, n (%)*	*Normal, n (%)*	*Total*	*P value*
School					
Government	9 (5.5)	23 (14.0)	132 (80.5)	164	0.017
Private	22 (15)	21 (14.4)	103 (70.6)	146	
Age					
10-12	16 (12.9)	17 (13.7)	91 (73.4)	124	0.967
13-15	15 (8.06)	27 (14.5)	144 (77.4)	186	
Gender					
Males	14 (8.1)	20. (11.6)	139 (80.3)	173	0.111
Females	17 (12.4)	24 (17.5)	96 (70.1)	137	
Body Mass Index					
Obesity & Overweight	3 (11.6)	5 (19.2)	18 (69.2)	26	0.553
Normal	19 (12.3)	23 (14.8)	113 (72.9)	155	
Underweight	9 (7.0)	16 (12.4)	104 (80.6)	129	
Total	31 (10.0)	44 (14.2)	235 (75.8)	310	

prevent the complications in adulthood.

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Is Mid-upper Arm Circumference Alone Sufficient to Identify Severe Acute Malnutrition Correctly?

Anthropometric data of 2466 children in Haryana revealed low sensitivity (6.9%) and positive predictive value (14.3%) of Mid-upper Arm Circumference (MUAC) at 115 mm cut-off for identifying Severe acute malnutrition (SAM). This raises concerns regarding the reliability of MUAC as a screening tool to identify SAM at the community-level.

Keywords: *Anthropometry, Diagnosis, Undernutrition*.

Mid-upper-arm-circumference (MUAC) is used to detect severe acute malnutrition (SAM) among under-five children in community settings due to its ease of use. WHO had earlier fixed a cut-off of 110 mm, but later suggested a new cut-off of 115 mm for defining SAM based on experience from African countries [1]. However, there is a paucity of data validating these cut-offs in Indian setting [2].

A community-based cross-sectional survey was carried out in four districts of Haryana. In each district, 10% of Sub-centres (SC) areas were selected randomly with representation from rural, urban and slum areas according to Probability Proportionate to Size. 40 children were selected from each sub-centre, divided equally from two randomly selected villages under the Sub-centre. A total of 2466 children in the age group 6 mo-6 years were included in the study. Anthropometric measurements such as weight (up to nearest 1g, using TARE function), height (up to nearest 1 mm) and recumbent length in case of infants (up to nearest 1 mm) were measured using standard equipment and procedures by graduate level field investigators who were trained in use of anthropometric equipment [3]. The Mid Upper Arm Circumference (MUAC) was measured using Shakir's tape [4]. Nutritional assessment was carried out using WHO Child Growth Standards according to z-score classification. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of MUAC method was calculated for different cut-offs against weight-for-height Z scores below –3. Ethical clearance was obtained from the Institute Ethics Committee of Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh. The children diagnosed with SAM were referred to the district hospital, with follow up by local Auxiliary nurse midwife.

The study population included 1428 (58%) males. The mean (SD) age of subjects was 29.3 (14.5) months. The mean (SD) weight, height and MUAC were 10.5 (2.64) kg, 83.1 (10.67) cm, and 14.1 (1.4) cm, respectively. As compared to the gold standard test, MUAC (<115 mm) method was found to have a high specificity (96.4%) and NPV (92.2%) but very low PPV (14.3%) and sensitivity (6.9%). Sensitivity and positive predictive values were higher when MUAC –3 Z score cut-off was used as compared to MUAC less than 11.5 cm cut-off (***Web Table* I**). Prevalence of SAM when computed using WHZ scores was found to be 3.5% (children below –3 WHZ score), but with MUAC method, it was found to be 2.3% and 1.8% for children below –3 MUAC Z-score and children with less than 11.5 cm MUAC, respectively. In this study, the prevalence of SAM based on WHZ was found to around

two times than those based on a MUAC cut-off of 115 mm. Other studies have reported that MUAC and WHZ identify different populations of children with SAM [5,6]. Previous studies have recommended higher cut-off levels (135 or more, even 155 mm) [7,8]. In this study, the MUAC cut off at 115 mm had zero sensitivity in the 3-6 year age group though higher cut off levels (<130 mm) had better sensitivity (24.2%). Part of the explanation for our findings is that children with lower MUAC tend to be younger than those with lower weight-for-height scores. The results suggest that a single cut-off cannot be used to screen nutritional status for all children below six years but should be increased with increasing age of children, as stated in another study [9]. Generalizability might be an issue which necessitates large scale community studies.

MUAC alone does not appear to be appropriate for diagnosis of SAM. Keeping in view the findings of our study, MUAC may be used along with simple clinical indicators such as bipedal edema and weight-for-height cut-off measurements.

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Effect of Fortification and Additives on Breast Milk Osmolality

This study evaluated the effect of fortification and commonly used additives on the osmolality of human milk. Osmolality after fortification with milk powder and human milk fortifier increased from 303 mOsmol/kg to 397 and 373 mOsmol/kg, respectively. The maximal increase in osmolality was seen with the addition of calcium gluconate.

Keywords: *Breastfeeding, Human milk fortifier, Infant feeding*.

Fortification of human milk is commonly used to achieve adequate postnatal growth of preterm infants. This can be done using either commercially available human milk fortifiers (HMF) or infant milk powder [1]. Several studies have evaluated the effect of HMF on osmolality of milk, but effect of infant milk powder and other additives has not been adequately studied. Various additives like calcium, iron and multivitamins may increase the osmolality beyond the recommended levels (<450 mOsmol/kg) [2-4]. Increased osmolality of milk has been associated with feed intolerance, delayed gut emptying and necrotizing enterocolitis [3,5,6]. We evaluated the effect of different combinations of fortification and commonly used additives on the osmolality of preterm human milk.

The osmolality was measured with freezing point depression method, using an osmometer (Osmomat 030 Germany). A thermistor probe measured the difference in freezing point of the solution measured from the reference. The instrument was regularly calibrated and was checked with internal controls for each batch of analysis of milk samples. Freshly expressed breast milk (EBM) was

obtained from four mothers (24- 28yrs old, normal nutritional status, delivered at 32-34 weeks gestation) during their second week of lactation after informed consent. The EBM was fortified by adding 1g HMF or 1 g Infant milk powder to 25 mL of EBM. Osmolality was checked before and after fortification, and also after addition of several nutrients that are used commonly. This included coconut oil, multivitamin drops (containing 1000IU Vitamin A, vitamin B complex, 40 mg vitamin C and 200IU vitamin D in each ml), 3% NaCl, calcium gluconate (9.3 mg/mL elemental calcium), neutral phosphate (33 mg/mL elemental phosphate), and colloidal iron drops (25 mg elemental iron, vitamin B_{12} 5 mcg, folic acid 200 mcg in each mL).

Fortification using milk powder and HMF increased osmolality of EBM, from 303 mOsmol/kg to 397 and 373 mOsmol/kg, respectively. Addition of additives led to a further increase in the osmolality (***Fig.* 1**). The increase in osmolality was largest with addition of 10% calcium gluconate, and least with coconut oil (***Fig.* 1**). Though fortification or additives added alone to unfortified milk did not increase the osmolality beyond 450 mOsml/kg, addition of these additives to fortified milk increased the osmolality beyond this safe limit.

The increase in osmolality of milk by addition of HMF in our study was comparable to some earlier studies [7,8], but was less than that observed by Kreissl, *et al*. [9], who also observed marked increase in osmolality by addition of multivitamins, iron and calcium along with HMF.

Addition of additives to fortified milk should be done with caution as this may increase the osmolality of feeds beyond the safe limit. It is important to make paediatricians aware that fortification and additives increase the osmolality of milk which could potentially lead to gut injury in preterm neonates.

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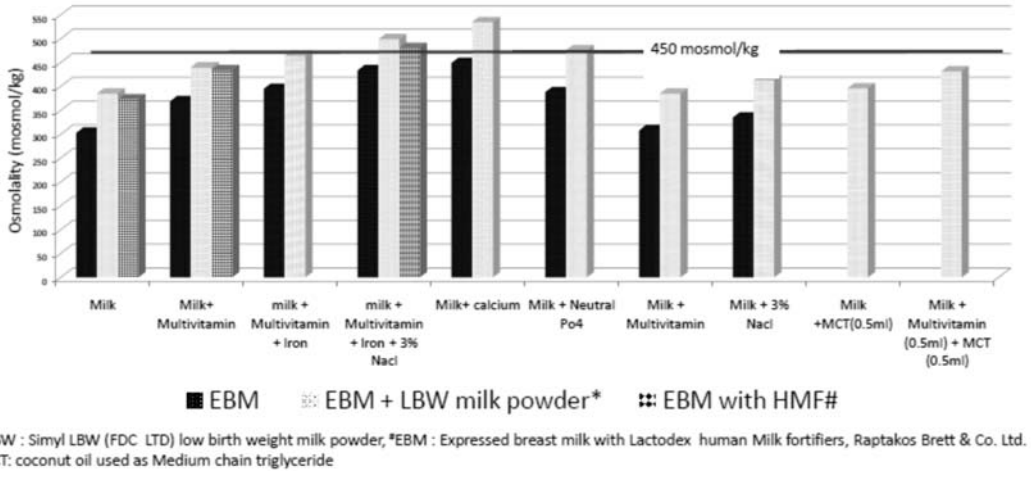

*LBW : Simyl LBW (FDC LTD) low birth weight milk powder, #EBM : Expressed breast milk with Lactodex human Milk fortifiers, Raptakos Brett & Co. Ltd.
MCT: coconut oil used as Medium chain triglyceride

***Fig.* 1**. *Osmolality of breast milk with fortification and different combinations of additives.*

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Papaverine for Ischemia Following Peripheral Arterial Catheterization in Neonates

11 Extremely low birth weight neonates who developed skin discoloration after peripheral arterial catheterization were given intra-arterial papaverine before the removal of arterial line. The skin color turned normal in all these neonates and none developed residual damage. In 3 neonates who could not receive papaverine, one developed gangrene of fingers. .

Keywords: *Arterial cannulation, complications, neonate, Vasospasm*.

Vascular spasm is a common complication of arterial catheterization, and is usually temporary and reversible [1]. Heparin and nitroglycerine (NTG) ointments have been used with varied success [2,3]. Papaverine is used in cardiac patients to relieve arterial spasm, and also to prolong the patency of arterial catheters in preterm neonates [4]. We retrospectively analyzed records of 14 extremely low birth weight (ELBW) neonates who developed skin discoloration following peripheral artery cannulation. Vasospasm was defined as complete perfusion recovery within 4 hours, thromboembolism as any discoloration of the skin not recovering within 4 hours, and residual damage as events leading to gangrene or loss of function of the extremity.

In the study period from January 2012 to December 2014, 47 ELBW neonates required 54 peripheral arterial line placements, 14 developed discoloration requiring arterial line removal. These infants were given intra-arterial papaverine before the removal of arterial line (6 posterior tibial and 5 radial) provided it was patent, and NTG patch was applied subsequently. The dose of papaverine used was 1 mg/kg [5, 6] diluted with 0.9% saline (1 mg: 1 mL), and infused over 5-10 minutes. Eleven neonates (gestational age 26-31 weeks; weight 0.56-0.98 kg) received intra-arterial papaverine. The skin color became normal in six neonates within 4 hours of removal of arterial lines, and in the remaining five, it normalized over next few days; none of these neonates developed residual damage. Three neonates could not receive papaverine because of line block; two of them achieved normal skin color and one developed gangrene of fingers. The limitation of present study include: retrospective analyses, no control group, use of another co-intervention (NTG) and a small sample size. Also, doppler studies were not performed to confirm ischemia/vasospasm.

Papaverine is an opium alkaloid with vasodilatory and spasmolytic action, due to its inhibition of oxidative phosphorylation and calcium flux, during muscle contraction. An earlier study demonstrated efficacy of papaverine in prolongation of patency of arterial catheters without an increase in hypotension and intraventricular hemorrhage, even in preterm neonates [4]. It seems that papaverine is also effective in preventing residual damage in arterial catheterization-induced ischemia in ELBW neonates. These preliminary findings need to be confirmed by well-designed controlled studies.

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Inappropriate Postural Habits of High School Students from the Municipality of Ceres, Brazil

This study aims to evaluate the prevalence of inappropriate postural habits in students. 827 Brazilian students aged 14 to 19 were evaluated with a self-administered questionnaire. A high prevalence of (>90%) inappropriate habits in sitting postures (on a chair, to write, and at a computer) and picking up an object off the floor was observed, suggesting the need to develop preventive programs.

Keywords: *Adolescent health, Epidemiology*, *Posture*.

Many postural problems affecting the general population [1], especially those related to the spine, start during growth and body development [2] - a period that coincides with the phase in which adolescents attend school. Identifying and understanding the postural habits of children and adolescents are important to prevent postural problems in adulthood. This information can guide both physical education and wider school policies [3,4]; therefore, the aim of this study was to verify the prevalence of inappropriate postural habits in students from Ceres, Goiás, Brazil, and compare the results between male and female students.

This cross-sectional study evaluated 827 students (49.3% males) aged 14 to 19 from Ceres, Brazil. To assess the prevalence of inappropriate postural habits, we used a self-administered questionnaire – the Back Pain and Body Posture Evaluation Instrument (BackPEI) – with versions specific to male and female students [5]. The questionnaires were filled out individually. Percentage analysis and the chi-square test were used to assess associations between postural habits and gender.

The results indicated a high prevalence of inappropriate postural habits in all postures, except in the means and mode of carrying school materials. Positive results were obtained with respect to the time spent watching television and at a computer because most of the students spent from 0 to 3 hours per day in these positions (85% and 81.3%, respectively). However, only 28.2% of the students slept 8 to 9 hours per night as recommended in the literature [3]. Differences between male and female students are presented in ***Table* I**. Appropriate sitting posture to write was seen in 6%, and for picking up objects from the floor in 10%, with no gender differences. Appropriate sitting posture on a chair/bench, and at a computer was seen in 4.2% and 9.8%, respectively. An appropriate means to carry school material (back pack with two straps) was used by 76.8% students, with 70.9% student appropriately using it (symmetrical on the shoulder). Boys had better postural habits than girls for the latter four variables (P <0.05).

Regardless of male and female student differences, our results are worrisome. More than 90% of the students remained in inappropriate sitting postures (generally, with an anterior flexion of the trunk and lack of lumbar and forearm support) and when picking up an object off the floor, predisposing them to a higher degree of general discomfort, such as fatigue and tingling affecting different parts of the body, back pain, and degenerative processes in the structures of the spine [1,6,7].

In contrast to these findings, most of the students correctly used a school backpack as a means to carry their materials (76.8%), which was symmetrically carried on their shoulders (70.9%). It is speculated that this result may reflect the effect of preventive programs carried out in recent years specifically to teach this habit and the great emphasis placed on this position by the media, whereas other postural habit interventions and/or initiatives have not been applied with such frequency and intensity [4,8,9].

The results of assessments such as those carried out in this study can be applied to direct educational and preventive interventions to improve postural habits [8]. Interventions can provide alternative to prevent such habits in the school environment that, once adopted at this stage of life, become permanent in adulthood [4,9,10].

Contributors: MN and PRSN: conception, design of the work, the acquisition, analysis and interpretation of data; Drafting the

TABLE I POSTURAL HABITS OF STUDENTS FROM ELEMENTARY SCHOOLS IN CERES, BRAZIL

Time/day	*Male, No. (%)*	*Female, No.(%)*
Watching television (n = 695)*		
0 to 3 h	314 (88.7)	277 (81.2)
4 to 5 h	29 (8.2)	50 (14.7)
≥ 6 h	11 (3.1)	14 (4.1)
Using a computer (n = 640)		
0 to 3 h	248 (76.3)	272 (86.3)
4 to 5 h	40 (12.3)	24 (7.6)
≥6 h	37 (11.4)	19 (6)
Sleeping time/night (n = 719)		
0 to 7 h	259 (71.5)	235 (65.8)
8 to 9 h	92 (25.4)	111 (31.1)
≥10 h	11 (3)	11 (3.1)

** P<0.05.*

work and revising it critically for intellectual content; EMS: Substantial contributions to the design of the work and the acquisition of data; drafting the work and revising it critically for intellectual content; ARSN: contributions to the design of the work and the acquisition of data; CTC: Interpretation of data and revising the manuscript critically for intellectual content. All authors approved the final manuscript.

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Oral Paracetamol for Closure of Patent Ductus Arteriosus in Selected Preterm Neonates

We prospectively studied the effect of oral paracetamol in closing hemodynamically significant Patent ductus arteriosus in preterm infants (gestational age <32 weeks) where Ibuprofen was contraindicated. 29 of 40 neonates (72.5%) showed successful response while 11 (29.5%) failed to show any response. No major complications were seen.

Keywords: *Paracetamol, Patent Ductus arteriosus, Prematurity.*

A hemodynamically-significant Patent ductus arteriosus (PDA) may cause cardiovascular instability, exacerbate respiratory distress syndrome and also prolong the requirement for assisted ventilation in preterm neonates. The options available to close the duct are pharmacological (Ibuprofen or indomethacin) and surgical. Recently, paracetamol has been shown to be an alternative treatment for closure of PDA [1-4]. We aimed to analyze the efficacy of paracetamol in closing PDA in preterm neonates where ibuprofen was contra-indicated.

This observational study was performed at a tertiary Level IIIB Neonatal Intensive Care Unit in Southern India. The study was approved by Institutional ethics committee. Preterm neonates with hemodynamically-significant PDA where ibuprofen was contraindicated-platelet count < 60,000/mm^3, serum creatinine >1.5 mg/dL, necrotizing enterocolitis and bleeding diathesis [4,5], were included. Hemodynamically significant PDA was defined as transductal size >1.5 mm with Left atrium to Aortic root diameter >1.4 mm or reversal of diastolic flow in descending aorta causing increased fraction inspired oxygen (FiO_2 of >40% or oxygenation index of >10 on invasive ventilation). Neonates with major congenital abnormality, elevated liver enzymes (AST >55 U/L or ALT >23 U/L) [6], and those with perinatal asphyxia were excluded. An informed consent was obtained from the parents. Echocardiography was performed by the same Pediatric Cardiologist. Oral paracetamol (Crocin drops 100 mg/mL, GlaxoSmithKline Asia), 15 mg/kg/dose every 6 hourly (gestational age >30 weeks) or 8 hourly (gestational age <30 weeks), was administered. There were 192 preterm neonates (gestational age <32 weeks) admitted in the unit during study period, of which forty were given paracetamol. Mean (SD) birth weight and gestation were 1186 (289) grams and 29 (1.9) weeks, respectively. All the neonates had PDA size of more than

1.5 mm and Left-atrium to aortic ratio of more than 1.4 mm; five had reversal of blood flow in descending aorta. The contraindications for ibuprofen were coagulopathy (*n*=25), suspected necrotizing enterocolitis (*n*=12), thrombocytopenia (*n*=7), Intraventricular hemorrhage (*n*=5), and oliguria (*n*=3). Of 40 neonates, 29 (72.5%) showed successful response while 11 neonates (29.5%) failed to show the response. PDA was found to be closed on day 3 in 10 cases (25%), day 4 in 17 cases (42.5%) and day 5 in 1 case. There was mild elevation of liver enzymes in 22 cases (55%) which returned to baseline spontaneously. No major complication pertaining to treatment was observed. Eleven neonates (28.5%) failed to show response; of which, two underwent ligation, four responded to repeat oral ibuprofen, one was lost to follow-up, and the remaining four responded to repeat doses of oral paracetamol.

Earlier observational studies [7,8] and randomized controlled trials [1,9,10] have also documented successful closure of hemodynamically significant PDA in preterm neonates. Our study adds to the evidence that oral paracetamol may be used as an alternative for PDA closure in preterm infants where ibuprofen is contra-indicated. The limitations of our study were lack of pharmacokinetic data (*i.e.*, optimal dosage, time to start therapy and route of administration), no control arm and lack of external validity. Spontaneous closure of PDA could also have confounded the results. We conclude that oral paracetamol is an alternative treatment for PDA closure where oral ibuprofen is contraindicated.

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