WAIST HEIGHT RATIO AS A MARKER OF OBESITY AND INSULIN RESISTANCE IN ADOLESCENTS

V. Sri Nagesh,[1] Rakesh Kumar Sahay,[2] Neelaveni Kudugunti, MD, DM,[2] Vishnu Vardhan Rao.M, PhD,[3] Aditya Vikram B, MBBS,[4] Sridhar Bathula, MD, DM,[5] Syed Mustafa Hashmi, MBBS,[2] Sana Hyder, MBBS,[2] Sania Jiwani, MBBS[2] and Hari Mohan R, MBBS[2]

[1]CARE Out Patient Centre, CARE Hospital, Hyderabad, [2]Osmania Medical College, Hyderabad, [3]National Institute of Nutrition, [4]Gandhi Medical College, [5]Kakatiya Medical College

PREVALENCE OF OBESITY – VARIOUS STUDIES

RISING TREND IN PEDIATRIC OBESITY
% RISE OVER 1989 DATA
BOYS - 9.1%.   GIRLS – 5.1%.

- Need a structured program to monitor childhood obesity at community level.
- Incorporate anthropometric and biochemical markers to study impact of obesity on insulin resistance and cardiovascular risks.
- Need to be " INDIA SPECIFIC".

CURRENT ANTHROPOMETRIC MARKERS

BMI	WC	WAIST HIP RATIO
Percentile charts relative to age and sex .	Percentile charts relative to age and sex .	Cutoffs not validated for children.
Cannot differentiate muscle mass from bone and fat mass	Few cutoffs validated for Indian children	Has not correlated well with other markers in most studies
Not a measure of central obesity.		

REQUIRE A MARKER THAT:
- Measures central obesity
- Does not require age and gender matched charts.
- Is applicable to Indians.

WAIST HEIGHT RATIO
- More accurate tracking indicator of fat distribution and accumulation by age.
- Cut-off of = 0.5 yet to be validated.

OBJECTIVES
1. To study the utility of WHtR as a marker of insulin resistance.
2. Association of WHtR and the 2 other commonly used markers – BMI and WC.
3. Association of WHtR, lifestyle factors and biochemical markers.
4. Validate the presently used cutoff for WHtR (=0.5).

MATERIALS AND METHODS
- Cross-sectional
- School-based
- Epidemiological study.
- Adolescents in the 11-17 year age group were included.

INCLUSION CRITERIA / EXCLUSION CRITERIA

INCLUSION CRITERIA	EXCLUSION CRITERIA
"All the adolescents who had consented to be a part of the study and were 11-16 years old."	1. Secondary causes of obesity like Cushing's syndrome, hypothyroidism and genetic disorders of obesity. 2. Pre-existing diabetes or cardiovascular disorders.

EVALUATION :
- History and physical examination.
  Questionnaire:
- Dietary history including snacks
- Access to parks and playgrounds.
- Physical activity
- Screen time and TV meals.

INTERVIEW OF PARENTS :
- Birth history
- Breast feeding and nutritional history
- Development history
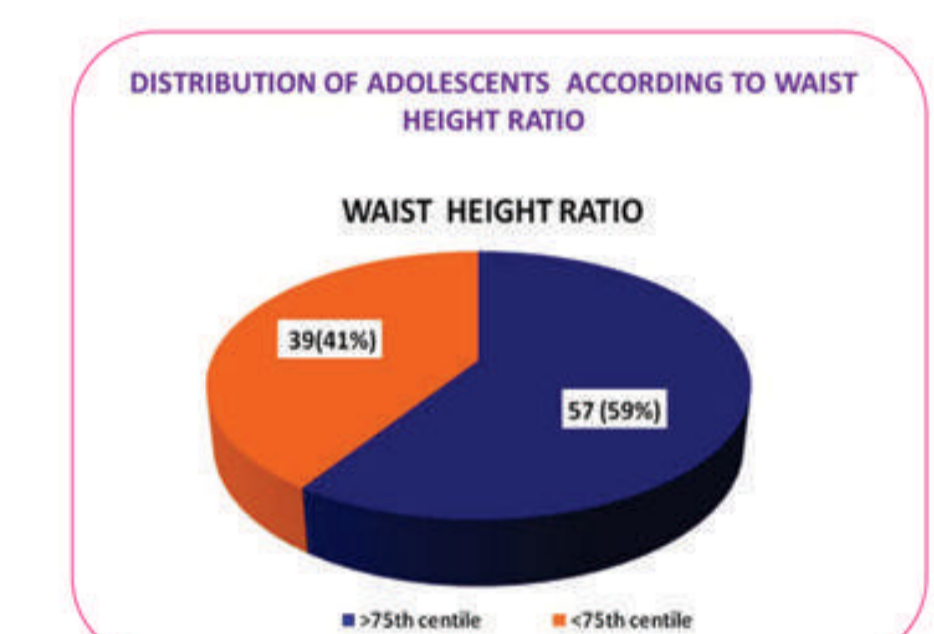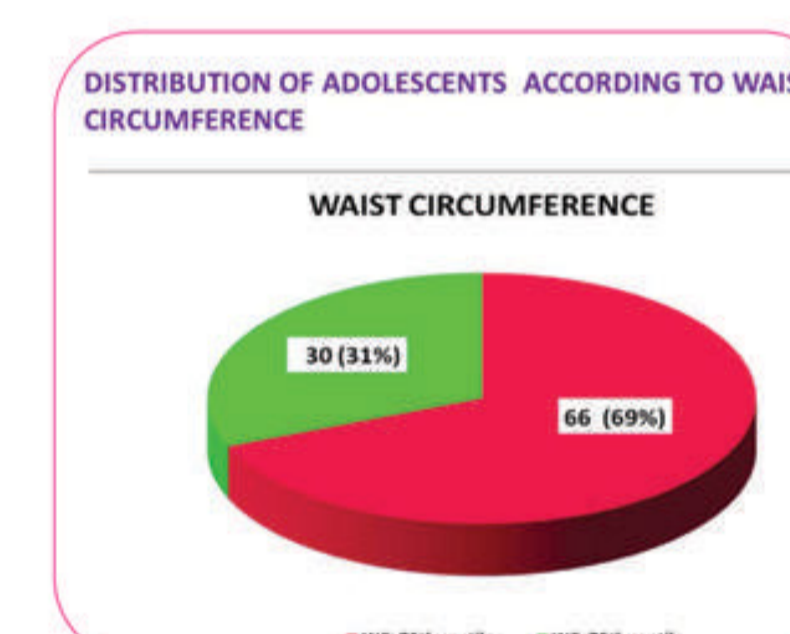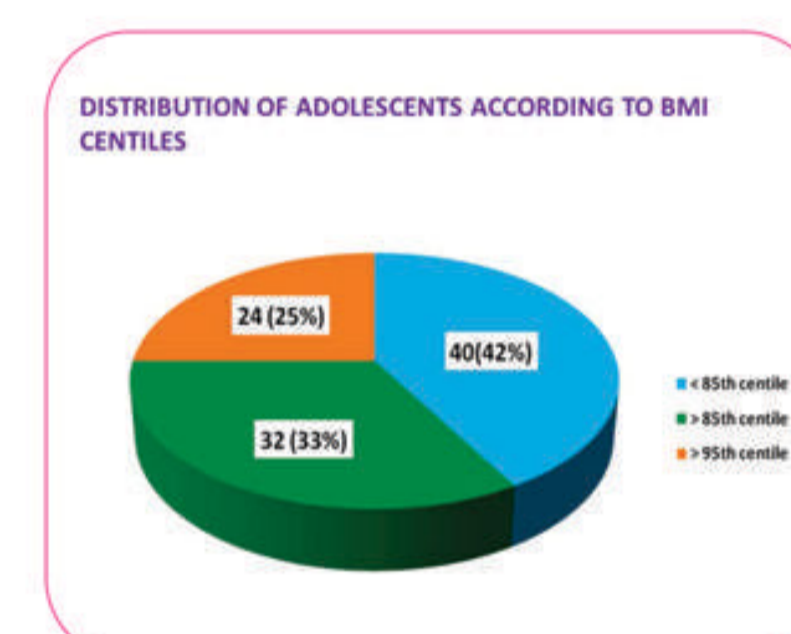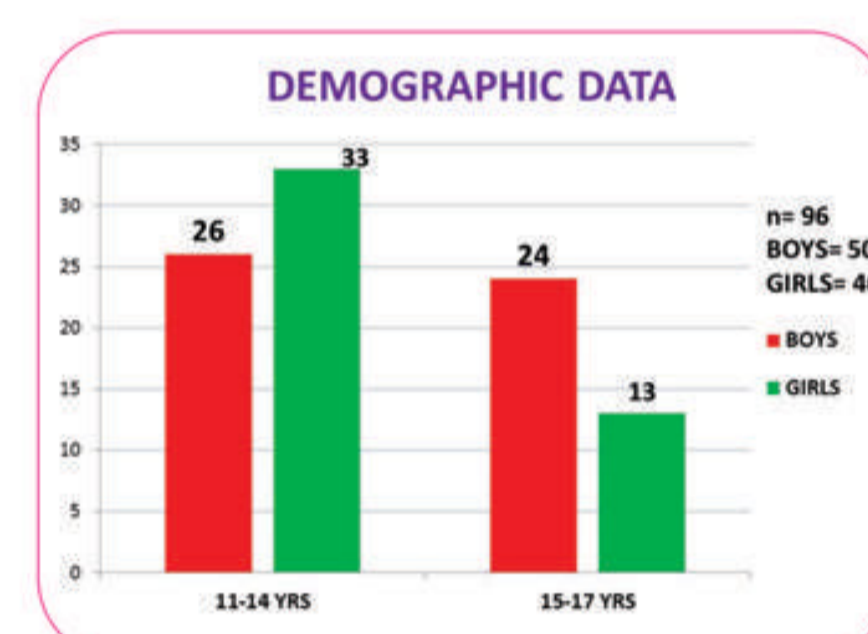- Family history of T2DM and obesity

ANTHROPOMETRY :
- Height
- Weight
- BMI
- Waist circumference
- Waist height ratio
- Triceps skin fold thickness
- Fat percentage by bio-impedance technique.
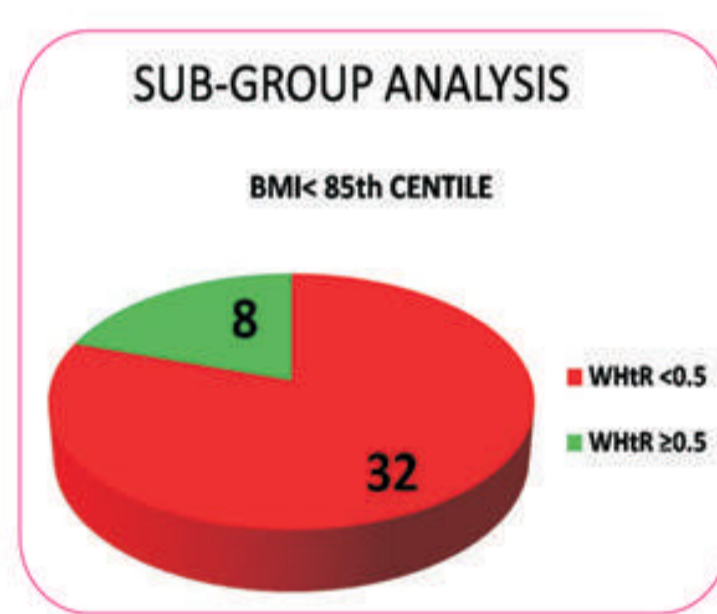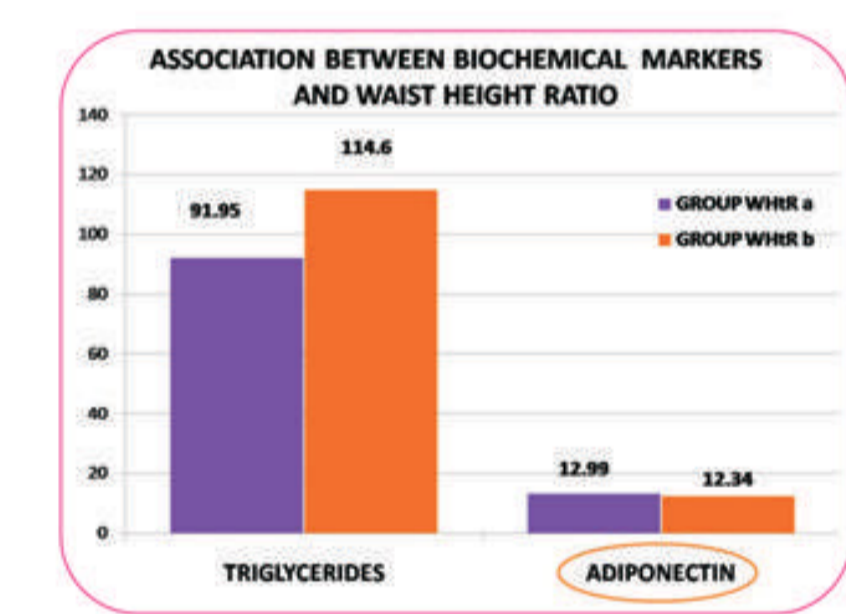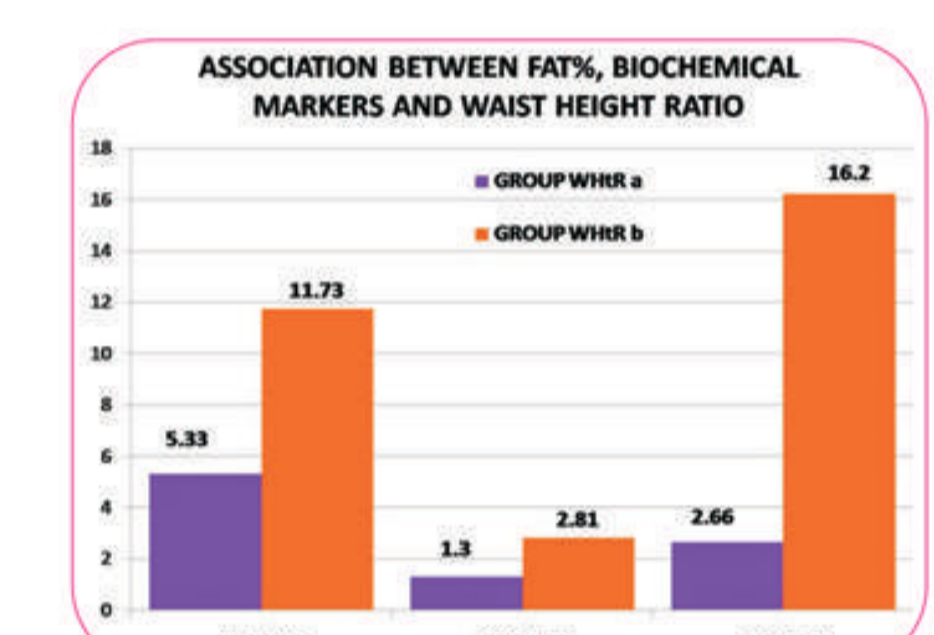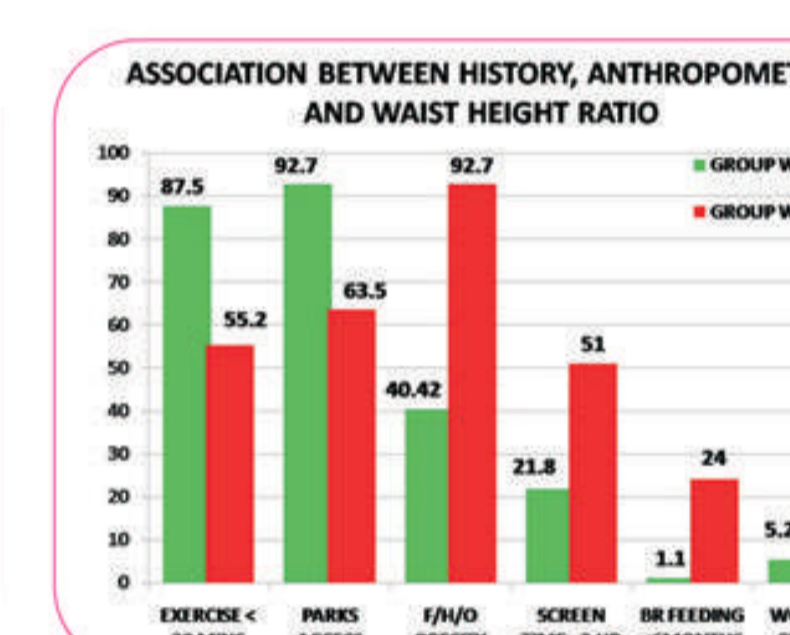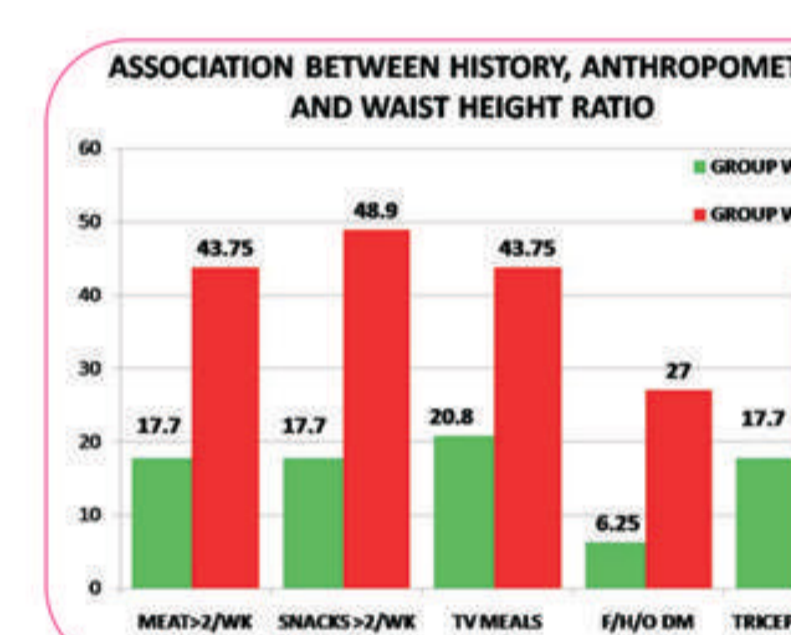
BIOCHEMICAL ANALYSIS :
- Fasting samples for:
- Blood glucose
- Insulin
- hs-CRP
- Adiponectin
- Lipid profile
- HOMA-IR was also calculated

SUB-GROUPS FOR ANALYSIS
- BMI: Group 1–<85th centile for age, Group 2– 85th to 95th centile for age, Group 3–> 95th centile for age.
- WC > 75th centile for age.*
- WHtR ≥ 0.5.
- Triceps skin fold thickness > 75th centile for age.
- Rest of the parameters were computed as continuous variables.

DEMOGRAPHIC DATA

DISTRIBUTION OF ADOLESCENTS ACCORDING TO BMI CENTILES

DISTRIBUTION OF ADOLESCENTS ACCORDING TO WAIST CIRCUMFERENCE

DISTRIBUTION OF ADOLESCENTS ACCORDING TO WAIST HEIGHT RATIO

BMI AND WC ASSOCIATIONS

ASSOCIATION BETWEEN HISTORY, ANTHROPOMETRY AND WAIST HEIGHT RATIO

ASSOCIATION BETWEEN HISTORY, ANTHROPOMETRY AND WAIST HEIGHT RATIO

ASSOCIATION BETWEEN FAT%, BIOCHEMICAL MARKERS AND WAIST HEIGHT RATIO

ASSOCIATION BETWEEN BIOCHEMICAL MARKERS AND WAIST HEIGHT RATIO

SUB-GROUP ANALYSIS

INTRA-GROUP ANALYSIS BMI< 85TH CENTILE – WHtR < 0.5 vs WHtR ≥ 0.5

VARIABLE		p Value
SNACKS> TWICE A WEEK		0.044
F/H/O OBESITY		0.025
BREAST FEEDING		0.096

INTRA-GROUP ANALYSIS BMI< 85TH CENTILE

VARIABLE	WHtR < 0.5	WHtR ≥ 0.5	p Value
FAT %	18.3	23.33	0.019
INSULIN	5.4	5.1	0.881
hs CRP	3.72	2.57	0.460
HOMA-IR	1.37	1.26	0.833
TG	98.8	91.83	0.643

CUT-OFFS

TERTILE	WHtR	hs-CRP	HOMA-IR
I	≤ 0.48	2.07	1.13
II	0.49-0.53	6.95	1.85
III	≥ 0.54	10.17	3.48

COMPARISON WITH OTHER STUDIES

LIMITATIONS
1. Small sample size.
2. Cross sectional study.
3. Correlation of anthropometry and biochemical markers with puberty status was not ascertained.
4. Four site skinfold thickness was not obtained.

CONCLUSIONS
1. WHtR is good marker of insulin resistance and inflammation and correlates well with other anthropometric markers.
2. Lifestyle factors and biochemical markers also correlated well with WHtR.
3. Children with normal BMI could still have central obesity indicated by a high WHtR and could be at risk for future complications of obesity.
4. The present cutoff of ≥ 0.5 can also be applied to Indian children, but more research is required to determine the best cutoff for our Indian children.
5. WHtR has the potential to become "the anthropometric marker" to define insulin resistance and cardio-vascular risk in future community studies.

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The authors of this study have no conflicts of interest to disclose.

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Fat 1
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