Obesity and Overweight in Relation to Hypertension and Associated Risk in School Children

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ABSTRACT

Aim: Hypertension is a major public health problem worldwide and is associated with high mortality and morbidity. The main aim of this study is to assess obesity and overweight in school children and their relationship to hypertension and associated risk factors.

Study Design: Population based cross sectional study.

Results and Discussion: A total number of 712 students with age group between 7-12 years from different school were screened for their height, weight and body mass index. The present study was aimed to assess obesity and overweight in school children and their relationship to hypertension and associated risk factors. Under weight and healthy weight children are engaged in physical activities like playing in ground and thus they are healthy where the children who found as overweight and obese were not engaged in physical activities regularly and thus this might be the reason for their overweight and obesity. At the same time the children who found as obese and overweight were said that they were having fast foods twice a day.

Conclusion: In order to get rid of these risks and their associated cardiovascular risks, their food habits must be changed and physical activities needs to be improved.

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1. INTRODUCTION

Hypertension is a major public health problem worldwide and is associated with high mortality and morbidity. With globalization bringing more lifestyle modifications, adolescents are now exposed to multiple risk factors which make them highly prone towards hypertension at a younger age. The increasing rate of cardiovascular diseases (CVD) has become an alarming health problem across the globe [1-2]. The Global Burden of Diseases study has reported that by the year 2025, CVD would be the major cause of death all over the world including the developing countries. Though hypertension is a problem of adult age, but its etiologic process begins in childhood. Evidences accumulated globally have documented the prevalence of childhood hypertension 1-2% in the developed countries and 5-10% in the developing countries [3]. The prevalence of adolescent hypertension in various Indian studies ranges from 0.96% to 11.4% [4-5]. Hypertension is a known risk factor for coronary artery disease (CAD) in adults and the presence of childhood hypertension contributes to the early Development of CAD. According to many studies carried out world-wide the prevalence of hypertension in children and adolescents appear to be increasing. The growing prevalence of hypertension is coupled with increase body weight and many reports have shown an association between blood pressure (BP) and body mass index (BMI) [6].

The World Health Organization (WHO) defines overweight and obesity as abnormal or excessive fat accumulation that presents a risk to health. A body mass index (BMI) _25 kg/m² is generally considered overweight, while obesity is considered to be a BMI _30 kg/m². According to the previous data, there are wide variations in the prevalence of obesity throughout the world, ranging from India, where 1% or less of the population is obese, to the Pacific Islands, where the prevalence of obesity can reach up to 80% in some regions [6-7]. Although obesity was initially most visible in developed countries, recent global figures indicate that it is increasing in the developing world. As developing countries have become wealthier, marked change in lifestyles cause obesity development. So that WHO emphasizes the importance of monitoring the prevalence and secular trends for overweight and obesity in each country. Childhood overweight and obesity are increasingly prevalent global problems and have received much attention in recent years. Obesity is evolving as a major nutritional problem in the developing countries, affecting a substantial number of adults and resulting in an increased burden of chronic disease [8-9]. These are serious public health challenges of the 21st century as it appears to increase the risk of subsequent morbidity, whether or not obesity persists into adulthood. The knowledge that blood pressure during childhood is an established predictor of adult blood pressure, which in turn increase mortality from CVD and the need for establishing preventive measures in early life [10]. The main aim of this study is to assess obesity and overweight in school children and their relationship to hypertension and associated risk factors.

2. METHODOLOGY

2.1 Study Site

High schools in anantapur.

2.2 Study Type

Population based cross sectional study (different group of people for particular time period).

2.3 Study Duration

Six (6) months.

2.4 Study Procedure

The following instruments were used in the survey to collect data.:

- Pre-tested Questionnaire in English and telugu to collect personal particulars, family history of HTN/DM/CAD/Stroke, dietary habits, physical activity, TV watching, use of extra salt, transport to school
- OMRON Electronic weighing scale to measure weight in kgs up to 100 gms accuracy.
- Stadiometer to measure Height to the nearest of 0.1 cms.
- Mercury gravity sphygmomanometer with proper cuff size to measure the Blood Pressure accurately.
All the participants were explained about the purpose of the study along with the scope of future intervention, if necessary. They were ensured strict confidentiality, and then informed consent was taken from each of the participants before the total procedure. The participants were given the options not to participate in the study, if they wanted.

Data regarding family and personal information were recorded by personal interview by the principal investigator. It was followed by weight measurement and BP check-up as mentioned below in details. Children from the representative sample were called for screening according to their classes and were given rest for 5 min.

The procedures were explained briefly and demonstrated to them. Blood pressure was measured in each subject three times by the same observer using standard mercury sphygmomanometer with appropriate cuff size. Two readings of the BP of each child were taken, with an interval of 5 min between each reading. Third reading taken during next visit. The mean of three readings was calculated.

The weight and height of each child were recorded. Height was measured by a WHO approved wall-mounted height measuring scale. An Electronic weighing scale to measure weight in kg up to 100 gms accuracy was used to measure weight. Overweight and obesity were defined by body mass index (BMI) for gender and age. Gender, age and height were considered for determining hypertension. Children with a BMI >85th percentile of reference data were considered overweight and those with a BMI >95th percentile were considered obese. Statistical Analysis: Descriptive analysis (Percentages).

3. RESULTS

A total number of 712 students with age group between 7-12 years from different school were screened for their height, weight and body mass index. Out of 712 children 379 (53.23%) were boys and 333(46.76%) were girls. The overall prevalence of boys and girls having underweight were 263 (53.98%) and 225 (46.10%) respectively. The prevalence of boys and girls having healthy weight were 96 (54.85%) and 79 (45.14%) respectively. The prevalence of boys and girls having overweight were 8 (80%) and 2(20%) respectively. The prevalence of boys and girls having obese were 12(30.76%) and 27(69.23%) respectively.

The prevalence of systolic blood pressure is higher in healthy weight children compared to underweight and obese children but the prevalence of diastolic blood pressure higher in underweight children compared to healthy children and obese.

4. DISCUSSION

A total number of 712 students with age group between 7-12 years from different schools in Ananthapuramu were screened for their height, weight and body mass index. In the present study more number of children is underweight. This indicates that underweight children are having more BMI. One study anticipates that more number of children belongs to normal weight. Our study shows that blood pressure in underweight children is 93.18% [11]. There is no systolic and diastolic blood pressure in
overweight children. Study anticipates that the systolic and diastolic blood pressure is high in obese followed by overweight [12].

Our study shows that underweight and healthy weight children are hypertensive compared to the overweight and obese. Study anticipates that hypertension is more in overweight and obese children which is different from our study [13]. In our study we found that children who eat junk foods almost daily have high prevalence of obesity and hypertension compared to those who eat occasionally. In the present study underweight and healthy weight are engaging in physical activities compared to the overweight and obese. The same findings were seen in the study [14] which reveals that underweight and healthy weight were more engaged in physical activities. A junk-food dietary pattern at 3 years of age was associated with obesity at 7 years of age in an unadjusted model. A junk food dietary pattern was characterized by increased levels of fizzy drinks, sweets, chocolates, chips, fried foods and other junk foods. There was no significant relationship with obesity for a healthy, traditional,

Table 1. Results related to physical activities

| S. No | Physical activities | Under weight | Healthy weight | Over weight | Obese | Total |
|-------|---------------------|--------------|----------------|-------------|-------|-------|
| 1.    | Happy with your health | Yes          | 476(97.94%) | 167(94.35%) | 10(100%) | 39(100%) | 692(97.19%) |
|       |                     | No           | 10(2.05%)   | 10(5.64%)   | 0(0%)  | 0(0%)  | 20(2.80%)   |
| 2.    | Vigorous Physical activities | <30 minutes | 114(23.45%) | 57(32.38%)  | 3(27.27%) | 15(38.46%) | 189(26.54%) |
|       |                     | 31-60 minutes | 26(5.34%)  | 5(2.84%)   | 2(18.18%) | 3(7.69%)  | 36(5.05%)   |
|       |                     | >60 minutes   | 11(2.26%)  | 2(1.13%)   | 0(0%)   | 1(2.56%)  | 14(1.96%)   |
|       |                     | Not sure      | 335(68.93%) | 112(63.63%) | 6(54.54%) | 20(51.28%) | 473(66.43%) |
| 3.    | Moderate physical activities | <30 minutes | 101(20.78%) | 54(30.68%)  | 3(30%) | 11(27.5%) | 169(23.73%) |
|       |                     | 31-60 minutes | 14(2.88%)  | 4(2.27%)   | 0(0%) | 3(7.5%) | 21(2.94%)   |
|       |                     | >60 minutes   | 2(0.41%)  | 3(1.70%)   | 0(0%) | 3(7.5%) | 5(0.70%)   |
|       |                     | Not sure      | 369(75.92%) | 115(65.34%) | 7(70%) | 26(65%) | 517(72.61%) |
| 4.    | Daily walking | <30 minutes | 175(36.00%) | 61(34.65%) | 4(40%) | 21(52.5%) | 261(36.65%) |
|       |                     | 31-60 minutes | 13(2.67%) | 4(2.27%) | 0(0%) | 2(5%) | 19(2.66%) |
|       |                     | >60 minutes | 4(0.82%)  | 3(1.70%) | 0(0%) | 3(7.5%) | 7(0.98%)   |
|       |                     | Not sure      | 294(60.49%) | 108(61.36%) | 6(60%) | 17(42.5%) | 425(59.69%) |
| 5.    | Spending time in watching TV | >3 hours | 69(14.77%) | 30(15.38%) | 4(40%) | 21(52.5%) | 102(14.32%) |
|       |                     | 2-3 hours     | 47(10.06%) | 35(17.94%) | 0(0%) | 4(10.25%) | 86(12.07%) |
|       |                     | 1-2 hours     | 141(30.19%) | 58(29.74%) | 3(27.27%) | 16(41.02%) | 218(30.61%) |
|       |                     | < 1 hour      | 184(39.40%) | 60(30.76%) | 5(45.45%) | 12(30.76%) | 261(36.65%) |
|       |                     | None          | 26(5.56%) | 108(61.36%) | 6(60%) | 17(42.5%) | 425(59.69%) |
| 6.    | Playing video games | >2 hours | 31(6.39%) | 22(12.5%) | 0(0%) | 1(2.56%) | 54(7.58%) |
|       |                     | 2-3 hours     | 37(7.61%) | 15(8.52%) | 0(0%) | 5(12.82%) | 57(8.00%) |
|       |                     | 1-2 hours     | 95(19.54%) | 23(13.06%) | 2(18.18%) | 8(20.51%) | 128(17.97%) |
|       |                     | < 1 hour      | 232(47.73%) | 80(45.45%) | 5(45.45%) | 18(46.15%) | 335(47.05%) |
|       |                     | None          | 91(18.72%) | 36(20.45%) | 4(36.36%) | 7(17.94%) | 138(19.38%) |
| 7.    | Visiting play ground for playing | Daily | 41(8.43%) | 4(2.27%) | 0(0%) | 2(5.12%) | 47(6.60%) |
|       |                     | Two days once | 300(61.72%) | 104(57.95%) | 9(81.81%) | 29(74.35%) | 442(62.07%) |
|       |                     | Three days once | 76(15.63%) | 39(22.15%) | 2(18.18%) | 7(17.94%) | 124(17.41%) |
|       |                     | Four days once | 69(14.19%) | 29(16.47%) | 0(0%) | 1(2.56%) | 99(13.90%) |
Table 2. Results related to nutrition and diet

| S. No | Food habits | Under weight | Healthy weight | Over weight | Obese | Total |
|-------|-------------|--------------|----------------|------------|-------|-------|
| 1.    | Having rice with vegetable or meat gravy |             |                |            |       |       |
|       | Always      | 62 (12.75%)  | 32 (18.18%)    | 0 (0%)     | 4 (10%)| 98 (12.32%) |
|       | Often       | 250 (51.44%)| 68 (38.63%)    | 4 (40%)    | 20 (50%)| 342 (48.03%)|
|       | Sometimes   | 163 (33.53%)| 67 (38.06%)    | 6 (60%)    | 16 (40%)| 252 (35.39%)|
|       | Seldom      | 10 (2.05%)   | 9 (5.11%)      | 0 (0%)     | 0 (0%) | 19 (2.66%) |
|       | Never       | 1 (0.20%)    | 0 (0%)         | 0 (0%)     | 0 (0%) | 1 (0.14%)  |
| 2.    | Having whole grains in a week |             |                |            |       |       |
|       | None        | 41 (8.43%)   | 19 (10.73%)    | 1 (11.11%) | 4 (10%)| 65 (9.12%) |
|       | 1-3 times   | 421 (86.62%) | 137 (77.40%)   | 8 (88.88%) | 36 (90%)| 602 (84.55%)|
|       | 4-6 times   | 23 (4.73%)   | 17 (9.60%)     | 0 (0%)     | 0 (0%) | 40 (5.61%) |
|       | >7 times    | 1 (0.20%)    | 4 (2.25%)      | 0 (0%)     | 0 (0%) | 5 (0.70%)  |
| 3.    | Fast food habits |             |                |            |       |       |
|       | Daily       | 12 (2.46%)   | 6 (3.38%)      | 0 (0%)     | 3 (7.5%)| 21 (2.94%) |
|       | Two days once | 262 (53.90%)| 70 (39.54%)    | 7 (77.77%) | 24 (60%)| 363 (50.98%)|
|       | Thrice in a week | 143 (29.42%)| 51 (28.81%)   | 2 (22.22%) | 12 (30%)| 208 (29.21%)|
|       | More than thrice a week | 69 (14.19%) | 50 (28.24%) | 0 (0%) | 1 (2.5%) | 120 (16.85%) |
| 4.    | Having food at restaurants |             |                |            |       |       |
|       | Daily       | 3 (0.61%)    | 3 (1.69%)      | 0 (0%)     | 0 (0%) | 6 (0.84%)  |
|       | Two days once | 169 (34.70%)| 58 (32.76%)    | 5 (55.55%) | 18 (46.15%)| 250 (35.11%)|
|       | Thrice in a week | 160 (32.85%)| 44 (24.85%)   | 1 (11.11%) | 6 (15.38%)| 211 (29.63%)|
|       | More than thrice a week | 155 (31.82%)| 72 (40.67%) | 3 (33.33%) | 15 (38.46%)| 245 (34.41) |

Table 3. Results related to family history

| S. No | Family history of disease | Under weight | Healthy weight | Over weight | Obese | Total |
|-------|----------------------------|--------------|----------------|------------|-------|-------|
| 1.    | Consulting family doctor   |              |                |            |       |       |
|       | Monthly                    | 28 (5.76%)   | 29 (16.47%)    | 0 (0%)     | 1 (2.56%)| 58 (8.14%) |
|       | Quarterly                  | 123 (25.30%) | 30 (17.04%)    | 3 (27.27%) | 10 (25.64%)| 166 (23.31%)|
|       | Half yearly                | 213 (43.82%) | 61 (34.65%)    | 5 (45.45%) | 13 (33.33%)| 292 (41.01%)|
|       | Yearly once                | 122 (25.10%) | 56 (31.81%)    | 3 (27.27%) | 15 (38.46%)| 196 (27.52%)|
| 2.    | Parents having             |              |                |            |       |       |
|       | Hypertension               | 142 (31.55%) | 51 (25.75%)    | 2 (11.11%) | 12 (26.08%)| 207 (29.07%)|
|       | Diabetes                   | 147 (32.66%) | 72 (36.36%)    | 3 (16.66%) | 15 (32.60%)| 237 (33.28%)|
|       | Both                       | 20 (4.44%)   | 17 (8.58%)     | 8 (44.44%) | 3 (6.52%) | 48 (6.74%)  |
|       | None                       | 141 (31.33%) | 58 (29.29%)    | 5 (27.77%) | 16 (34.78%)| 220 (30.89%) |
| 3.    | Usage of medicines by parents |          |                |            |       |       |
|       | Yes                        | 262 (51.47%) | 70 (50.72%)    | 17 (80.95%)| 24 (54.45%)| 373 (52.38%)|
|       | No                         | 247 (48.52%) | 68 (49.27%)    | 4 (19.04%) | 20 (45.45%)| 339 (47.61%) |

or fussy dietary pattern. In the present study the prevalence of hypertension is high in the parents of underweight children 142 (31.55%) followed by prevalence of diabetes is high in the parents of healthy weight children 36.36% followed by both are high in overweight children 44.44%. The same findings were seen in the study conducted by Bhoomi Arora et al. 2017 [4] which reveals that prevalence of diabetes is high in parents of healthy weight children and the prevalence of hypertension and diabetes are high in overweight. In the present study fast food habits are high in overweight children 77.77% whereas Bhoomi Arora et al. 2017 [4] study anticipates that fast food habits are high in underweight children. Therefore, the authors conclude that this very small effect is unlikely to be of substantial clinical importance. Our study generated awareness about dangers of obesity and hypertension among children, guardians and
teachers. We strictly followed the current recommendation for children in detecting elevated BP that can only be confirmed after a minimum of three separate BP measurements.

5. CONCLUSION

The present study was aimed to assess obesity and overweight in school children and their relationship to hypertension and associated risk factors. Under weight and healthy weight children are engaged in physical activities like playing in ground and thus they are healthy where the children who found as overweight and obese were not engaged in physical activities regularly and thus this might be the reason for their overweight and obesity. At the same time the children who found as obese and overweight were said that they were having fast foods twice a day. In order to get rid of these risks and their associated cardiovascular risks, their food habits must be changed and physical activities needs to be improved.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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