Original Research Paper

Volume - 14 | Issue - 01 | January - 2024 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Paediatrics

PREVALENCE OF VARIOUS CO MORBIDITIES IN CHILDHOOD OBESITY

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ABSTRACT

Aims and Objectives

1. To determine the prevalence of various co- morbidities associated with childhood obesity in school going children in Davanagere.
2. To determine the clinical profile of childhood obesity among school going children.

Materials and Methods : All School going children aged 5-16 years in Davanagere city whose BMI is more than 27 adult equivalent on the sex and age specific IAP BMI chart were included in the study. Their demographic variables were recorded and assessed for hypertension, dyslipidemia, obstructive sleep apnea, gastro esophageal reflux, left ventricular hypertrophy in hypertensive obese children, depression, Non alcoholic fatty liver disease and asthma. Data was entered and analysed using SPSS software version 22.0 by appropriate statistical tests.

Results: In our study, out of 100 obese children studied 19% were hypertensive, 42% had dyslipidemia, 38% with obstructive sleep apnea (OSA), 21% gastro esophageal reflux disease (GERD), 7% hypertensive obese had left ventricular hypertrophy (LVH), 9.5% had depression, 30% fatty liver on USG and 31% had coexisting Asthma and obesity. Out of the 100 obese children , 57 were male and 43 were females with 29 from rural area and 71 from urban area and 60% belonging to class I, II and III SES according to modified B. G. Prasad classification.

Conclusion: Based on the present study findings, we can conclude that, Childhood obesity is associated with various significant co- morbidities , some of which can lead to adverse adulthood cardiovascular problems. Hence it is very important for the policy makers and health care professionals to enlighten and educate the children and parents and teachers as a unit regarding importance of healthy diet with appropriate physical activity and to minimize the screen time in budding children

KEYWORDS : Childhood obesity, Hypertension, Asthma, Dyslipidaemia,.

INTRODUCTION

Globally, the prevalence of childhood obesity is increasing in recent years. Childhood obesity has emerged as one of the world health problems with 200 million school children as being obese/overweight, of which 40-50 million are obese[1]. Currently there are 14.4 million children with obesity and the figures are set to raise to a staggering 17.3 million in India and will become world's 2nd largest nation with childhood obesity by 2025 according to World obesity federation[2]. Urbanisation is the single most important factor linked to obesity in India. 30% obesity begins in childhood and 50-80% of them become obese adults. Past four decades has seen almost a tenfold increase in the rise of number of children with obesity which could in turn lead to a decline in the overall life expectancy in the future. Many studies have documented the rising trend of childhood obesity in the recent years, so we wanted to conduct a study to know the prevalence of various co-morbidities in the childhood obesity in Davanagere.

MATERIALS AND METHODS

This is a school based cross sectional study. The schools have been selected by simple randomized sampling. Informed consent was obtained from parents/ guardians and the school administration prior to study enrolment. Ethical clearance was obtained from the Institutional Ethical Committee, JJM Medical College, and RGUHS. Initially all children were screened for weight, height and BMI and those children whose BMI was above 27AE on IAP-2015 BMI charts were taken as participants of the study. The process was carried out till 100 participants were recruited into the study. Their demographic variables were recorded. Then they were assessed for various co-morbidities and complications.

All obese children in the study underwent testing for

1. Blood pressure measurement was done manually using sphygmomanometer in sitting position in right arm.
2. Lipid profile to diagnose dyslipidaemia
3. Ultrasonogram was done to detect for NAFLD.
4. 2D-ECHO was done if child was hypertensive to detect LVH.

Hypertension was defined as consistent 2 BP recordings ≥95th percentile for the age and sex.

Children were categorized as dyslipidemic on the basis of NCEP-3 guidelines and other diseases as explained above in the methodology.

Other morbidities like GERD, OSA and depression were diagnosed based on individual questionnaires. In OSA modified STOP-BANG was used and a score of more than 3 were taken as positive for OSA. In GERD questionnaire a score of more than 8 was taken as child is having GERD. In PHQ-A questionnaire for depression a score of more than 10 was taken as depression.

The anonymity of the students was maintained in this study.

RESULTS

- Out of 100 obese children it was found that majority (57) were males , but it was not statistically significant [table 1] . Among 100 obese children 60 children belonged to class I and II according to modified B. G Prasad classification.
- Mean age of childhood obesity of the full group was 12.04±2.474 years. Mean BMI of the group was 23.91±2.13 kg/m^2 and mean weight of the group was 49.67±11.82 kg[table 2]. Obesity was seen more in the adolescent children in the age group of 11 to 16 years than in school going children in the age group of 5 to 10 years which is statistically significant.

Table 1 : Sex Distribution Of Obesity In Children.

	MALE	FEMALE	P - value
OBESE	57%	43%	
MEAN AGE+SD	12.19+2.36 yrs	11.84+2.656 yrs	0.4883
MEAN WEIGHT+SD	50.49+11.69	48.59+12.04	0.4289
MEAN BMI+SD	23.69+1.98	24.2+2.29	0.2362

Table 2 : Age Wise Distribution Of Obesity In Children.

	5-10 YRS	11-16 YRS	P - value
OBESE	37%	63%	-
MEAN AGE+SD	10.09+1.296 yrs	13.62+1.396 yrs	-
MEAN WEIGHT+SD	36.67+5.67	57.31+6.64	<0.01
MEAN BMI+SD	21.71+1.52	25.20+1.14	<0.01

In this study a staggering 42% had dyslipidaemia on their Lipid

profiles which is a forerunner of metabolic syndrome and will track into adulthood causing significant CVS morbidities. Of these 100 obese children, 19 children had blood pressure recordings of more than 95thpercentile on 2 occasions and were labelled hypertensive. Of the 19 hypertensive obese children 7 had left ventricular hypertrophy on 2D-ECHO. In our study 30% had fatty liver on Ultrasound examination. It was also found that 31% of obese children had Asthma and 38% had high risk of developing obstructive sleep apnoea, 21% of the children had high chances of having Gastro-oesophageal reflux disease and 10% of the adolescents, especially females in the study had depression mainly owing to body dissatisfaction[Fig 1].

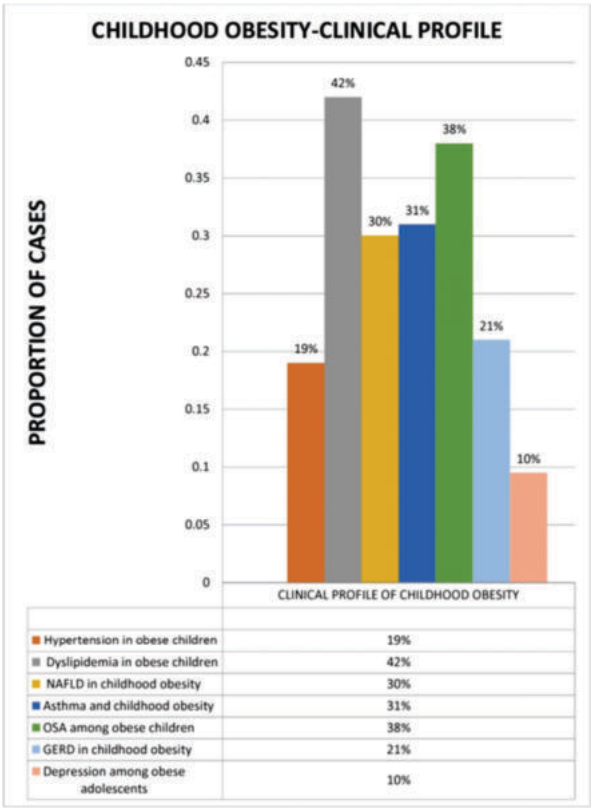

Figure 1 : Clinical Profile Of Various Comorbidities Associated With Childhood Obesity.

DISCUSSION

Obesity in children and adolescents is one of the major public health challenges of the 21st century. Overweight and obesity primarily happen either due to excess caloric intake or insufficient physical activity or both. With globalization, increase in fast food consumption in the recent years has directly correlated with increase in the prevalence of obesity. Children from families whose both parents are working are given fast foods more often as they found most convenient.

Gulati et al, found that a majority of children surveyed in from urban centres preferred to eat out, they felt that home food was old fashioned. Almost half of them also had their evening meal while watching television[3]. Sedentary lifestyle, such as TV viewing, smart phone usage, computer use and playing video games, in childhood seem to have a detrimental effect on body composition[4]that could be due to lower energy expenditure (less time for physical activity, lower resting metabolic rate) or increased energy intake.

Kunwar et al. studied the prevalence of obesity in school children in a s military station in North-Eastern India and concluded that the prevalence of obesity in garrison schools was lower due to the greater emphasis laid on games and physical activity[5]. Walking or cycling to school also resulted in a lower fat mass index[6].

Govindan et al. found that watching TV for >2 h/d was significantly associated with obesity[7]. Also, every additional hour of TV-time per day increases the prevalence of obesity in children by 2%[8].

Furthermore, the problem of obesity can be traced back from pre conception time. Placental insufficiency can influence altered pancreatic function and insulin sensitivity. These effects can continue into adulthood, increasing the risk for obesity- related conditions, such as metabolic syndrome[9]. Nutrient restraint from maternal malnutrition in the first 2 trimesters of pregnancy is strongly associated with birth weight and an increased risk of obesity in children[10]. Maternal obesity, especially in the first trimester, increases the risk that a child will be obese by age 4 years[11]. Maternal weight gain throughout pregnancy is also associated with a higher likelihood of childhood obesity[12].

Also, various genetic factors play a role in its pathogenesis. Although several genetic contributors to obesity have been identified in the past few decades, only 176 recognized cases of obesity have been linked to single-gene mutations in humans[13]. Leptin deficiency has been described in a few small series of families of Pakistani origin, characterized by severe obesity, hyperphagia, and other abnormalities[14] The melanocortin 3 (MC3R) and melanocortin 4 (MC4R) receptors are key in eating behaviours. MC3R defects may have a role in body weight regulation in African American children. MC4R mutations are found in more than 3% of early onset severe obesity in children[15].

Some studies have suggested that breastfeeding exerts a protective effect on childhood obesity while early introduction of infant formula or solid foods increases the risk of obesity[16]. The underlying mechanisms may be metabolic or behavioural and most likely based on the differences in the compositions of human milk and infant formulas[17].

The International obesity task force(IOTF) has calculated the 10% global prevalence of obesity in children 5-17 years[18]. The Indian Medical Association(IMA) issued a letter named “Childhood obesity a major public health crisis today” dated 25-10-2017 which stated that there are a staggering 14.4 million obese children in India.

A High Level meeting of the UN General Assembly held in 2011 determined to tackle non-communicable diseases[19] and with other things called for recommendations on a set of global targets. In May 2012, the 65th World Health Assembly endorsed the complete Implementation Plan on Maternal, Infant and Young Child Nutrition[20] which had 6 global nutrition targets to be achieved by 2025, including Target 4: no increase in childhood overweight, which were applicable to infants and young children up to age 5 years, and took estimates of 6.7% of pre-school children (43 million under-fives) for the 2010 baseline[21].

On the assumption of continued population growth given by the World Bank, this would translate to a rise from some 219 million children in this age group in 2010 to 268 million children by 2025. Obesity alone rises from 76 million children(4.8%) in 2010 to 91 million(5.4%) by 2025. Of this 91million obese children India with a staggering 17 million by 2025 will be the second largest contributor to global burden of childhood obesity[18].

Childhood obesity is a predecessor of metabolic syndrome, poor physical health, mental disorders, respiratory problems and glucose intolerance, all of which can track into adulthood[22]. There are many diseases associated with obesity which needs to be understood as many of them track into adulthood and increase the burden of non-communicable disease (NCD) in adulthood. The various diseases associated with childhood obesity include Cardiovascular(CVS) problems like hypertension(HTN), Left ventricular hypertrophy (LVH) [23], Metabolic problems like dyslipidaemia and metabolic syndrome, Pulmonary problems like asthma and obstructive sleep apnoea(OSA)[24], Gastrointestinal problems like gastro-oesophageal reflux disease(GERD)[25] and Fatty liver, Psychological problems like Depression[26] and other bone and joint problems.

The epidemic of obesity along with hypertension (HTN) and cardiovascular disease is a growing contributor to global disease burden. Paediatric hypertension is one of the strongest predictor of adult hypertension, which increases the cardiovascular mortality risk in adults[27].

As with high blood pressure, left ventricular hypertrophy has also been linked with increased BMI in children. The most important aspect of body composition that affects left ventricular mass is lean body mass, possibly because the heart's development matches the development of

the body's muscles to which it must supply blood[28]. LV after load which is elevated in obese individuals due to both rise in peripheral resistance and greater conduit artery stiffness. Right ventricular after-load may be increased, presumably due to associated sleep disordered breathing and LV changes[29].

Non-alcoholic fatty liver disease(or fat deposition in the liver) and non-alcoholic steatohepatitis (or an inflammation of the liver related to fat deposits) are recognized as complications of obesity in adults. Some studies have attempted to estimate the prevalence, with one calculating that as many as 50 percent of obese children may have fat deposits in their livers while some 3 percent of obese children have the more advanced non-alcoholic steatohepatitis[30].

Prevalence of Paediatric metabolic syndrome in childhood has been linked to increasing Type I DM, insulin resistance has been clearly implicated in pathogenesis of hypertension, coronary artery disease and PCOS[31]. The dyslipidaemia pattern in paediatric obesity consists of a combination of elevated TGs, decreased HDL-C, and top normal to mildly elevated LDL-C[32]. Recent NHANES data indicate this pattern is highly prevalent, present in 42.9% of children with BMI greater than the 95th percentile[33]

Among obese children, appearance related teasing is frequent and associated with higher weight concerns, more loneliness, and poor self-perception of physical appearance, higher preference for sedentary or isolated activities and lower preference for social activities[34].

Despite various public health programs under-nutrition still persists in India however in the recent years over-nutrition is also emerging as an important public health problem. This underscores the importance of screening children for obesity regularly in schools and the role of paediatricians, teachers and parents in recognising these obese children to take appropriate timely action.

CONCLUSION

Obesity in Indian school children is a cause of concern. It needs multi-pronged approach to tackle this menace. It needs all stake holders to join hands. Active life style and healthy diet should start from the pre-conception time, continues during pregnancy and to be continued through all stages of childhood. Family and parental involvement play a paramount role in preventing children from becoming obese. Involving families and school teachers creating awareness regarding healthy diet, promoting increased physical activity through role play, skits, and group activities. In view of rising concerns of obesity and its health effects, there is an urgent need to educate the Indian community on the aspects of healthy food habits and desired lifestyles to prevent obesity and its associated ill effects.

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