



Association of High BMI with wheeze in Children- A prospective study in a tertiary care Medical college and Hospital.

KEYWORDS

Non atopic wheeze, Atopic wheeze, BMI, Transient wheeze

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ABSTRACT

An increase in BMI(Body mass index)is directly correlated with asthma as reported in lot of studies in the affluent communities and most of the literature studied extensively in the adult population. As wheeze is a predominant sign of Asthma, though all wheezers are not always stamped as permanent asthmatic. Epidemiological studies in various countries demonstrated that in vast majority of cases , asthma symptoms start in the 1st ten years of life, so one can say it is a predominant pediatric disease. In this prospective study we found some correlation of high BMI with wheeze in early childhood age of 2-10 years and their subsequent outcome.

Introduction:

Wheeze in children is characterized by musical sound produced mostly during expiration due to narrowing of airway following inflammation and oedema of the small airways. All wheezing children never develop asthma in later life. For predicting that the child may develop asthma in later life, Asthma predictive index(API) was developed by Castro- Rodriguez(1). In this index, patient's clinical and laboratory criteria were taken and prediction of asthma in preschool age were determined. API was said to be positive if the child had more than 3 episodes of wheezing in the first 3 year of life + 1 major criteria (Clinical diagnosis of eczema in the child or Parents with asthma) or 2 minor criteria (Wheeze is not related to cold, Medical history of allergic rhinitis, Peripheral eosinophil count > 4%). In one study in Tamilnadu, India,there is prevalence of wheeze is around 18% in the age group of 6-12 years(2). Body mass index in children is calculated by child's weight in kilograms divided by the square of height in meters It is an inexpensive method to calculate the actual body fat indirectly which is a potential risk factors for different diseases in children. BMI is plotted in a curve developed by CDC which is specific for age and sex in which 5th -85th percentile of BMI is called as normal for that age and sex. More than 85th percentile is overweight and more than 95th percentile BMI is obese(3). The overall prevalence of overweight and obesity was 18.2% by the IOTF (International obesity task force) classification and 23.9% by the WHO standards in a study conducted in India taking the subjects from 11 schools at different zones of the country and incidence of obesity and overweight were found to be more in boys(4). High BMI can lead to wheeze and asthma possibly by deranged lung function, sedentary life style, inflammation influenced by adipokines(5).

According to Castro- Rodriguez there are three phenotypes of wheeze in children.

Transient wheezers- These children are born with lower lung function and symptomatic only in the first 3 years of life without any family or personal history of atopy(6). Risk factors for transient wheezer are prematurity, in utero exposure to tobacco,exposure to siblings in the creches,younger age of the

mother(7,8).

Non atopic wheezers:

These groups of children present with recurrent wheeze in the late infancy and preschool age without any family history of atopy / asthma in family and their symptom continue till preadolescence period and disappear after that age(9). Stein et al demonstrated that if a child had infection with Respiratory syncytial virus in the first 3 years of life, may continue to wheeze till 11 years of age without any atopy(10).

Persistent atopic wheezers:

These groups of children develop obstructive symptoms in the first 3 years of life and continue to wheeze till late adolescent. They have significant family history of atopy or asthma. These children have initial normal lung function but declines significantly as the age progresses and continued till the age of 18 years(11,12.) In this study we had found association of high BMI for particular age and sex with phenotypic variants of wheeze. In this study we found some correlation of high BMI in children with different phenotype of wheeze and also the gender based difference.

Period of Study- AUGUST 2015- JULY 2016

Materials and Methods:

All children admitted into the pediatric ward within the age of 2-10 years with wheeze as a predominant sign were subjected for the assessment of their individual BMI estimation by taking the height and weight. Children below 2 years of age were excluded from the study as most of them were transient wheezers following viral respiratory infections and do not develop asthma in later childhood. Out of those admitted, children with BMI more than 85th percentile for the age and sex, as per CDC curve were taken into the study. All such children were grouped in the age group 2-3years (Group 1), 4-6years (Group 2), and 7-10 years (Group 3). All the Children were followed closely for 12months for the persistence of wheeze or any spontaneous recovery by taking proper history from the parents. There were 3 categories of wheezers made according to the family history, Clinical presentation.

Category 1- Transient Wheezer (Early onset at 2years or before and subsides by 3 years of age)

Category 2- Non atopic wheezer (Start at any age without any history of asthma/atopy and persist for 5-6 year after the onset). Category 3 – Atopic Wheezer (Starts at any age, but with a definite family history of asthma or atopy and persists for longer period).

Results:

Total patients with wheeze admitted during the period were 265. Out of which 84 Wheezy patient having BMI more than 85th Percentile were taken into the study. Atopic wheezers were less common than non atopic wheezers in our study. In 12 patients more than 3 attacks of wheeze in a year was found and all were atopic wheezers.

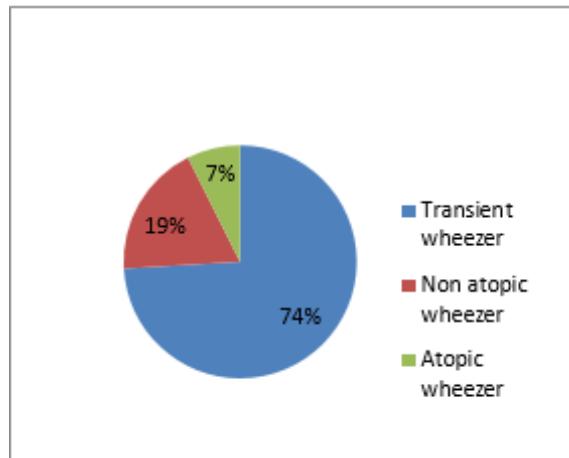


Fig 1. Incidence of different wheezers

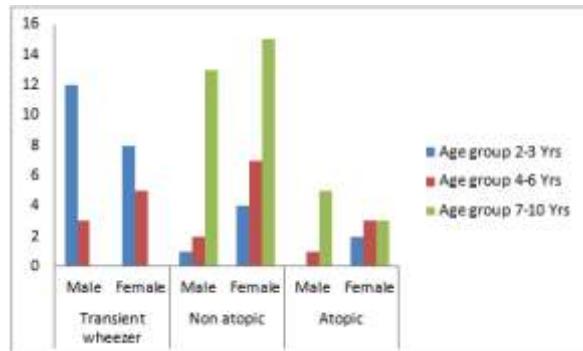


Fig 2. Wheezers in different age group

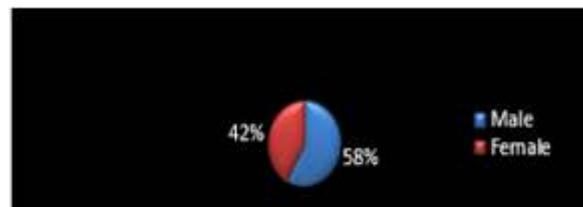


Fig 3. Sex Distribution of wheezy children having BMI >85th percentile

Discussion:

An increase in the prevalence of obesity in the developed world and simultaneous increase incidence of asthma and atopy stimulate researchers to find out the causal relationship with each other(13). Some studies in animal model suggest that Obesity is a proinflammatory state, where there is increased level of Leptin, IL6, IL1 (proinflammatory cytokines) which contribute to the airway inflammation(14). In our study we

found the incidence of non atopic wheezer is more than atopic wheezer which was similar to the study done by R Dinesh et al but in our study the transient wheezers were the second most common type associate with BMI > 85%, which was not found in their study, (Figure.1). Gender based difference have been observed in some studies where High BMI associated with asthma in children were commonly found in girls.(15,16) In our study non atopic wheezers were commonly seen in girls with High BMI as compared to boys, (Figure.2) but male predilection were found in transient wheezers in the early age group. Airway hyper responsiveness is the characteristic hallmark of wheezing children was found to be not associated with BMI in a study in New Zealand from birth to 27 years.(17) In our study we found around 30% association of wheeze in high BMI patients. Our study is also similar to the study by Gilliland et al which shows boys are usually more overweight than girls(18). In our study the male to female ratio of high BMI children was 1.4:1 (Figure.3). In our study transient wheezers with high BMI were mostly found in the early age group and male and female ratio for this category of wheeze was almost 1:1.

Conclusion:

From our study it is clear that non atopic and transient wheezers are more commonly associated with high BMI in children. Appropriate strategy must be taken by the community for reduction of weight. In one study from Germany, it was found that there was an increased risk of obesity in children who were not breast fed for at least five months(19). So promoting Breast feeding will be a simple and non expensive method to protect asthma and wheeze in children in developing country. More ever lifestyle modification, exercise, diet, reducing the time of television viewing can also prevent obesity and over weight in children and so also wheeze.

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Reference:

- Castro-Rodriguez JA, Wright AL, Taussig LM, Martinez FD. A clinical index to define risk of asthma in young children with recurrent wheezing. *Am J Respir Crit Care Med.* 2000;162: 1403-6. (22)
- Chakravarthy SK, Singh RB, Swaminathan S, Venkatesan P. Prevalence of Asthma in urban and rural children in Tamil Nadu. *Natl Med. J. India* 2002; 15: 260-263 (10)
- Freedman, D.S., Horlick, M. & Berenson, G.S., 2013. A comparison of the Slaughter skinfold-thickness equations and BMI in predicting body fatness and cardiovascular disease risk factor levels in children. *Am. J. Clin. Nutr.*, 98(6), pp.1417-24.
- Harish Ranjani, T.S. Mehreen, Rajendra Pradeepa, Ranjit Mohan Anjana, Renu Garg ,Krishnan Anand, Viswanathan Mohan. Epidemiology of childhood overweight & obesity in India: A systematic review. *Indian J Med Res* 143, February 2016, pp 160-174
- Dinesh Raj, Sushil K Kabra, R Lodha. Childhood Obesity and risk of Allergy or Asthma. *Immunol Allergy clin N Am*. 2014; 34: 753-765
- Martinez FD, Wright AL, Taussig LM, Holberg CJ, Halonen M, Morgan WJ, and the Group Health Medical Associates. Asthma and wheezing in the first six years of life. *New Engl J Med.* 1995;332:133-8.
- Speer CP, Silverman M. Issues relating to children born prematurely. *Eur Respir J.* 1998;27:13S-16S.
- Ball T, Castro-Rodriguez JA, Griffith K, Holberg CJ, Martinez FD, Wright AL. Siblings, day care attendance and the later risk of asthma and frequent wheeze in children. *New Engl J Med.* 2000;343:538-43.
- Stein RT, Holberg CJ, Morgan WJ, Wright AL, Lombardi E, Taussig LM, et al. Peak flow variability, methacholine responsiveness and atopy as markers for detecting different wheezing phenotypes in childhood. *Thorax.* 1997;52:946-52.
- Stein RT, Sherrill D, Morgan WJ, Holberg CJ, Halonen M, Taussig LM, et al. Respiratory syncytial virus in early life and the subsequent risk of wheezing and allergic sensitization by age 13. *Lancet.* 1999;354:541-5.
- Martinez FD, Wright AL, Taussig LM, Holberg CJ, Halonen M, Morgan WJ, and the Group Health Medical Associates. Asthma and wheezing in the first six years of life. *New Engl J Med.* 1995;332:133-8.
- Guerra S, Wright AL, Morgan WJ, Sherrill DL, Holberg CJ, Martinez FD. Persistence of asthma symptoms during adolescence: role of obesity and age at the onset of puberty. *Am J Respir Crit Care Med.* 2004;170:78-85.
- E von Mutius, J Schwartz, L M Neas, D Dockery, S T Weiss. Relation of body mass index to asthma and atopy in children: the National Health and Nutrition

- Examination Study III. *Thorax* 2001;56:835–838.
- 14. Visser M, Bouter LM, McQuillan GM, et al. Elevated C-reactive protein levels in overweight and obese adults. *JAMA* 1999;282:2131–5.
 - 15. Figueiroa-Munoz JL, Chinn S, Rona RJ. Association between obesity and asthma in 4–11 year old children in the UK. *Thorax* 2001;56:133–7.
 - 16. Kuschnir FC, da Cunha AL. Association of overweight with asthma prevalence in adolescents in Rio de Janeiro, Brazil. *J Asthma* 2009;46:928–32.
 - 17. Hancox RJ, Milne BJ, Poulton R, et al. Sex differences in the relation between body mass index and asthma and atopy in a birth cohort. *Am J Respir Crit Care Med* 2005;171:440–5.
 - 18. Frank D, Gilliland, Kiros Berhane, Talat Islam, Rob McConnell, W. James Gauderman, Susan S. Gilliland, Edward Avol, and John M. Peters. Obesity and the Risk of Newly Diagnosed Asthma in School-age Children. *American Journal of Epidemiology*. 2003;158:406–415.
 - 19. Von Kries R, Koletzko B, Sauerwald T, et al. Does breastfeeding protect against obesity? A cross-sectional study. *BMJ* 1999;319:147–50.