



Heredo-Familial Transmission of Allergies In India - Son Inherits The Disease From The Father And Daughter From The Mother

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Abstract

Background: Allergies are known to be heredofamilial diseases. Which parent confers an allergy risk factor to the child is an unanswered question in India.

Methods: 1353 consecutive patients suffering from one or more allergic diseases were included in this study. Patients were questioned regarding similar ailments in their family members and the results were analysed. Patients underwent a complete allergy workup, the results of which however, are not included in this study.

Results: The results obtained from this study showed that in India, the son inherits the disease from the father and the daughter from the mother. These results are significant in patients suffering from allergic asthma as also in those suffering from allergic rhinitis with allergic conjunctivitis. Results were highly significant in patients having allergic rhinitis and in those suffering from allergic asthma with allergic rhinitis. In patients suffering from allergic asthma with allergic rhinitis with allergic conjunctivitis and in patients having allergic asthma with allergic rhinitis with atopic eczema, the results were very highly significant.

Conclusions: In India, the son inherits allergic diseases from the father and the daughter from the mother. The statistical significance of this inheritance, increases when

the child suffers from more than one allergic manifestation.

Keywords: Allergies Daughter Father India Mother Son

Introduction

Allergic diseases such as asthma, rhinitis, conjunctivitis and atopic eczema are known to have a heredo-familial, polygenic transmission⁽¹⁾. However, there is no published data from India. An important question to be answered is whether the father or mother or both, confer an allergic risk factor to the child. The answer to this question would have implications for prediction and prevention of allergic diseases. Several studies have been published till-date on this subject from other countries and opinion is divided. This study was initiated to determine as to which parent transmits allergic disease to children in India- the father or the mother ?

Materials and Methods

This study was approved by the local ethics committee and was conducted in accordance with the Declaration of Helsinki and ICH Good Clinical Practice Guidelines.

1353 consecutive patients attending an allergy clinic in Bombay, India, from January 1, 2015 to December 31, 2016 were analysed. There were 696 males and 657

females in this study. The youngest patient was 6 years old and the oldest 73 years old. This allergy clinic is conducted by internists and therefore, children below 6 years age are not seen. Patients having allergic asthma, allergic rhinitis, allergic conjunctivitis and atopic eczema were included in this study. Stand-alone urticaria patients were excluded; however, we included patients with urticaria associated with other atopic diseases. Patients having contact dermatitis were also excluded from this study.

Each patient underwent a detailed history and physical examination. Patient history included details of family history, particularly those family members suffering from atopic diseases.

Patients underwent the following investigations:

1. Total serum IgE levels.
2. Allergy skin prick tests.
3. Pulmonary function tests using a computerised spirometer.
4. Peak Nasal Inspiratory Flow Rates (PNIFR) using a Youlten's peak nasal inspiratory flow meter.

The above investigations were used only to assess the patients and their results have not been analysed as part of the present study. Written, informed consent was obtained from each patient. Indeed, no patient refused to participate in this study.

Results

The results obtained from this study are tabulated in Tables 1, 2 and 3.

Statistical Analysis

Pearson's Chi-square test was used as a test of significance. Odds ratios and 95% confidence intervals were calculated. Strata 13.1 was used for data analysis. Results obtained from statistical analysis are tabulated in Table 3.

Discussion

Whether the father or mother transmits allergic diseases to the child is an unanswered question in India. Several studies have been done on this subject from other countries and the conclusions are varied.

With regard to asthma, some studies have shown that maternal asthma confers a risk of developing asthma in the child⁽²⁻⁵⁾, whereas other studies have been inconclusive^(6,7). In atopic eczema, some studies have concluded that the mother transmits the disease to the child⁽⁸⁻¹³⁾, whereas others have failed to replicate these results⁽¹⁴⁻¹⁷⁾. Studies on allergic rhinitis have however, failed to confirm which parent transmits allergic diseases to the child^(8,18).

Studies on more than one manifestation of allergic diseases have either been inconclusive as to which parent confers the disease^(5,18) or have had conflicting outcomes^(19,20) or have concluded that either the mother or the father could be responsible for transmitting the disease to both boys as well as girls and not to any particular sex⁽⁸⁾. One study showed that maternal and sibling allergy were significant but paternal allergy was not a significant risk factor⁽²¹⁾, whereas another study concluded that maternal allergy increased the risk in girls and paternal allergy increased the risk in boys⁽²²⁾.

The present study was done with patients suffering from either one or more than one manifestation of allergic diseases. It is very clear from the statistical results that allergic asthma alone and allergic rhinitis associated with allergic conjunctivitis had a statistically significant transmission from father to son and mother to daughter. In allergic rhinitis alone and in allergic rhinitis associated with allergic asthma, the transmission from father to son and mother to daughter becomes highly significant. Finally, in allergic asthma associated with allergic rhinitis and allergic conjunctivitis and in atopic eczema associated with allergic rhinitis and allergic asthma, the transmission from father to son and mother to daughter was very highly

significant, It could therefore be deduced from this study that the statistical significance of transmission from father to son and mother to daughter increases with multiple manifestations of allergic diseases in the offspring as compared to those suffering from a single manifestation.

Conclusions

1. In India, the son inherits allergic diseases from the father and the daughter from the mother.
2. The statistical significance of transmission from father to son and mother to daughter increases when the offspring has more than one allergic manifestation.

References

1. Kjellman N-I M. Atopic disease in seven-year old children. Incidence in relation to family history. *Acta Paediatrica* 1977; 66 : 465-71.
2. Litonja AA, Carey VJ, Burge HA, Weiss GT, Gold DR. Parental history and the risk of childhood asthma. Does mother confer more risk than father ? *Am J Resp Crit Care Med* 1998; 158 : 176-81.
3. Withers NJ, Low L, Holgate ST, Clough JB. The natural history of respiratory symptoms in a cohort of adolescents. *Am J Resp Crit Care Med* 1998; 158 : 352 – 57.
4. Burke W, Feisenmeyer M, Reed K, Hampson L, Carlsen C. Family history as a predictor of asthma risk. *Am J Prev Med* 2003; 24 : 160-69.
5. Lim RH, Kobzik L, Dahl M. Risk of asthma in offspring of asthmatic mothers versus father : a meta-analysis. *PLoS ONE* 2010; 5 : e10134.
6. Bjerg A, Hedman L, Perzanowski M, Platts-Mills T. Family history of asthma and atopy : an in-depth analysis of the impact on asthma and wheeze in 7 to 8 year old children. *Paediatrics* 2007; 120 : 741-48.
7. Cantani A, Micera M. A study on 300 asthmatic children, 300 controls and their parents confirms the genetic transmission of allergy and asthma. *Eur Rev Med Pharma Sc* 2011; 15 : 1051-56.
8. Dodd S, Wjst M, von Mutius E, Reitmeir P, Stiepel. Genetic risk for asthma, allergic rhinitis and atopic dermatitis. *Arch Dis Child* 1992; 67 : 1018-22.
9. Ruiz RG, Kemeny DM, Price JF. Higher risk of infantile atopic dermatitis from maternal atopy than from paternal atopy. *Clin Exp Allergy* 1992; 22 : 762-66.
10. Dotterud LK, Kvammen B, Lund E, Falk ES. Prevalence and some clinical aspects of atopic dermatitis in the community of Sor-Varanger. *Acta Derm Venereol* 1995; 75 : 50-53.
11. Diepgen TL, Blettner M. Analysis of familial aggregation of atopic eczema and other atopic diseases by odds ratio regression models. *J Invest Dermatol* 1996; 106 : 977-81.
12. Bradley M, Kockum I, Soderhall C, Van Hage-Hamsten, Luthman H, Nordenskjold M, et al. Characterization by phenotype of families with atopic dermatitis, *Acta Derm Venereol* 2000; 80 : 106-10.
13. Bisgaard H, Halkjaer LB, Hinge R, Giwercman C, Palmer C, Silveira L, et al. Risk analysis of early childhood eczema. *J Allergy Clin Immunol* 2009; 123 : 1355-60.
14. Bohme M, Wickmanwz M, Lennart Nordvaltz S, Svartgren M, Wahlgren CF. Family history and risk of atopic dermatitis in children upto 4 years. *Clin Exp Allergy* 2003; 33 : 1226 – 31.
15. Wadonda-Kabondo N, Sterne JAC, Golding J, Kennedy CTC, Archer CB, Dunnill MGS, et al. Association of parental eczema, hay fever and asthma with atopic dermatitis in infancy : birth cohort study. *Arch Dis Child* 2004; 89 : 917-21.
16. Zutavern A, Hirsch A, Leupoldz W, Weiland S, Keilk U, von Mutius E. Atopic dermatitis, extrinsic atopic dermatitis and the hygiene hypothesis : results from a cross sectional study. *Clin Exp Allergy* 2005; 35 : 1301-08.

17. Purvis DJ, Thompson JMD, Clark PM, Robinson E, Black PN, Wild CJ, et al. Risk factors for atopic dermatitis in New Zealand children at 3.5 years of age. *Br J Dermatol* 2005; 152 : 742-49.
18. Lee JT, Lam ZC, Lee WT, Kuo LC, Jayant V, Singh G, et al. Familial risk of allergic rhinitis and atopic dermatitis among Chinese families in Singapore. *Ann Acad Med Singapore* 2004; 33 : 74-4.
19. Croner S, Kjellman N-I M, Eriksson B, Roth A. IgE screening in 1701 newborn infants and the development of atopic diseases in infancy. *Arch Dis Child* 1982; 57 : 364-68.
20. Mandhane PJ, Greene JM, Cowan JO, Taylor DR, Sears MR. Sex differences in factors associated with childhood and adolescent onset wheeze. *Am J Resp Crit Care Med* 2005; 172 : 45-54.
21. Arshad SH, Stevens M, Hide D. The effect of genetic and environmental factors on the prevalence of allergic disorders at the age of two years. *Clin Exp Allergy* 1993; 23 : 504-11.
22. Arshad SH, Karmaus W, Raza A, Kurukulaaratchy RJ, Matthews SM, Holloway JW, et al. The effect of parental allergy on childhood allergic diseases depends on the sex of the child. *J Allergy Clin Immunol* 2012; 130 : 34.

Table 1: Distribution Pattern in Various Age Groups

Age Groups	Males	Females	Total
6 To 10 Years	41	19	60
11 To 20 Years	116	96	212
21 To 30 Years	187	181	368
31 To 40 Years	195	193	388
41 To 50 Years	97	95	192
51 To 60 Years	44	41	85
61 + Years	16	32	48
Total	696	657	1353

Table 2: Manifestations of Diseases & the Mode of Parental Transmission

Manifestations	Males					Females					Grand Total
	Paternal	Maternal	Both	None	Total	Paternal	Maternal	Both	None	Total	
Allergic Rhinitis	50	25	33	17	125	22	37	25	12	96	221
Allergic Asthma	28	15	17	13	73	15	29	22	10	76	149
Allergic Asthma + Allergic Rhinitis	82	48	52	25	207	45	74	45	25	189	396
Allergic Rhinitis + Allergic Conjunctivitis	42	23	29	14	108	21	41	24	10	96	204
Allergic Asthma + Allergic Rhinitis + Allergic Conjunctivitis	41	18	30	8	97	20	53	20	13	106	203
Atopic Eczema ± Allergic Asthma ± Allergic Rhinitis	40	13	30	8	86	21	35	22	16	94	180
Total	283	142	191	80	696	144	269	158	86	657	1353

Table 3: Statistical Analysis

Manifestations	Father To Son And Mother To Daughter	
	p Values	Statistical Significance
Allergic Rhinitis	= 0.009	Highly Significant
Allergic Asthma	= 0.025	Significant
Allergic Asthma + Allergic Rhinitis	= 0.001	Highly Significant
Allergic Rhinitis + Allergic Conjunctivitis	= 0.006	Significant
Allergic Asthma + Allergic Rhinitis + Allergic Conjunctivitis	< 0.001	Very Highly Significant
Atopic Eczema ± Allergic Asthma ± Allergic Rhinitis	< 0.001	Very Highly Significant