EXPOSURE TO FUNGI AND COMBUSTION PARTICULATES AMONG CHILDHOOD ASTHMATICS IN RURAL ENVIRONMENT

Submitted By
Maha El Sayed Hassan Selim
M.B.,BCH, Faculty of Medicine, Alexandria University, 1979

A thesis submitted in Partial Fulfillment
of
The requirement for the Master Degree
in
Environmental Science

Department of Environmental Medical Science
Institute of Environmental Studies and Research
Ain Shams University

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Approval Sheet

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I dedicate this work to the soul of ***my Father, my Mother and my Grand father*** ,**Prince / Moustafa Mounir Adham** who dedicated all his life and money and properties to encourage the scientific research in （History, Art and Science） to put Egypt on top of the world.

He was granted the Medal **(Nishan El Nile)** by **King Ahmed Fouad at 1924** because of his great achievements.

I also dedicate this work to the soul of my grand grand father.

Al Sharif Dr. Mohammed Bey El Shafei one of twelve excellent medical scholars who were selected by **Dr. Clute Bey** to be the members of the fourth educational mission to France (The greater medical mission), they were sent by **Mohammed Ali Pasha** to France at 1832 for their Doctor degree in Medicine.

After his return back from France he was appointed by **Mohammed Ali Pasha** as one of the first Egyptian professors and directors of **The Medical School of Kasr El-Einy** in Cairo, to be one of the celebrities of the Modern Egyptian Renaissance.

(He was the author and translator of four great works in Medicine).

Finally, and most importantly, I would like to thank my family especially my beloved nephews **Ismail, Ahmed El**

Sawy, Adham El Dafrawy and little **Yassin Aiman Selim** for their support, I want to plant in their mind that the value of education is priceless.

From the University of Ain Shams where one of their Grand fathers ***"Abd El Rehim Pasha El Demerdash"*** *dedicated a part of his properties to build this university in order to share in lighting the way of all students who seek a decent education in Egypt. I would like to deliver them the Torch of Nobility, Science, and Success.*

ABSTRACT

Background: Children growing up in rural environments that afford them a wide variety of microbial exposures are protected from childhood asthma and atopy. Conversely, urban air pollution may trigger asthma symptoms in sensitive children.

Subjects and Methods: Out of 1100 questionnaires completed 103 childhood asthmatics were diagnosed from an urban (Shoubra El Khema) and rural Kaliope areas (The study duration was 3 years).

Objective : To determine the prevalence of childhood asthma and atopy in rural versus urban environments and to compare dust microbiological contamination and endotoxin levels in rural and urban areas.

Results : It was found that out of 500 children in Shoubra El Khema region, 55 (11%) had asthma, while out of 600 children from Kaliope region, 48 (8%) were asthmatics, ($p < 0.05$).

Air pollutant, (nitrogen dioxide NO_2, sulfur dioxide, SO_2, Ozone, O_3 and particulate matter less than 10Mm in aerodynamic diameter, PM10) were higher in Shoubra El Khema compared to Kaliope.

Severe asthma was more prevalent in Shoubra El Khema, (18%) compared to Kaliope, (10.4%), $P < 0.05$.

Skin test reactivity to fungal spores were higher in Shoubra El Khema, (23.6%) compared to Kaliope (14.6%). Among patients sensitized to fungal allergens, aspergillus is in both urban and rural areas.

Skin test reactivity to house dust mite (HDM) was higher also,, in Shoubra El Khema, (16.36%) compared to (6.25%) in Kaliope, ($P < 0.05$).

Microbial contamination of dust, differed greatly in rural and urban areas, where mean values of contamination by total bacteria were significantly higher in Kaliope, 5.15 (CFU/m^3), $P < 0.05$. Also, mean values of Gram negative (G-ve) bacterial contamination were significantly higher, 3.51 (CFU/m^3) in Kaliope area compared to G-ve bacteria in Shoubra El Khema, 1.89 (FU) ($P < 0.05$).

Although/moulds concentrations in dust samples were higher in Kaliope, (1.97 CFU/m^3) compared to Shoubra El Khema, (1.88 CFU/m^3), the values were insignificant.

Endotoxin levels above 100 endotoxin unit (EU) were found in 11 out of 12 dust samples from Kaliope, (91.7%) compared to one out of 12 (8.3%) ($P < 0.000$).

Conclusion: Children living in rural areas had a wide range of microbial exposure and endotoxin, which might have protective effect against atopy and asthma.

Key words: Indoor air pollution, house dust, house dust mites, fungi, moulds, combustion particulates, endotoxins, aeroallergen, air pollution, atopy, asthmatic school children, rural environment, innate immunity.

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ABBREVIATIONS LIST

ABPA	Allergic bronchopulmonary aspergillosis
$ADAM_{33}$	A disintegrin and metalloprotease
AF	Aspergillus fumigates
AHR	Airway hypersponsiveness.
Alex. Study	Allergen and Endotoxin.
ANOVA	Analysis of variance.
BAL	Broncho-alveolar lavage.
BHR	Bronchial hyper-responsiveness.
CD	Cluster of differentiation.
CFU	Colony forming unit.
CI	Confidence interval.
DCs	Dendritic cells.
DEPs	Diesel exhaust particles
EIB	Exercise induced bronchospasm.
ELF	Epithelial lining fluid.
ETs	Environmental tobacco smoke.
EU	Endotoxin unit.
FeNO	Fraction of exhaled nitric oxide.
FEV_1	Forced expiratory volume in 1 second.
FVC	Force vital capacity.
GM-CSF	Granulocyte macrophage colony stimulating factor.
GSTP1	Glutathione S-transferase P1.
HDM	House dust mite.
ICAM-1	ICAM-1 Intercellular adhesion molecule-1
ICAS	Inner city asthma study
IgE	IgE Immunoglobulin E.
IL	Interleukin.
INF-γ	Interferon γ.
ISAAC	International study of asthma and Allergy in childhood

LAL	Limulus Amoebocyte lysate.
LISA	Life style-Immune System Allergy.
LPS	Lipopolysaccharides.
LTD_4	Leukotrienes D_4.
LTs	Leukotrienes.
MiRNA	Micro ribonucleic acid.
MRC	Modified medical research council
MSD	Maximum Symptom day
NAEPP	National asthma education and prevention program.
NHLBI	National Heart, Lung, and blood institute.
NO	Nitric oxide
NO_2	Nitrogen dioxide.
NST	Negative skin test
O_3	Ozone.
OR	Odd ration (probability of having or not having).
P	Probability of obtaining the value of the observed statistic.
PAF	PAF Platelet activating factor.
PAMPS	Pathogen associated molecular patterns
PCR	Polymerase chain reaction.
PM_{10}	Particulate matter (particles with diameter smaller or equal to 10 microns.
PST	Positive skin test
RSV	Respiratory syncytial virus
SAFS	Severe asthma associated with fungal sensitization
SO_2	Sulfur dioxide.
SPSS	Statistical Package for the Social Science.
SRS-A	Slow reacting substances of anaphylaxis.
TH_1	T helper lymphocytes type 1.
TH_2	T helper lymphocytes type 2.
TLR	Toll like receptor.