



## CRAB ALLERGY AND ASTHMA EXACERBATION IN CHILDREN: FOCUS ON PHARMACEUTICAL CARE

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### ABSTRACT

The patient was 8 years and 3 months female child with the height of 122cm, weight 22.4 kg and BMI of 15.05, indicating that she was underweight. She was brought to the causality with no cyanosis, and was able to speak little. Patient was generally alert and conscious. She was having shortness of breath and worsening by night, developed rashes over the oral, face body and limbs after eating crab meat at her friend's house. Her fast breathing was associated with wheezing. Patient has past medical history of asthma diagnosed at the age of 2 years old, allergic rhinitis and eczema. Patient's mother reported her child have an allergy towards penicillin and crab. The anti-asthmatic drugs were given along with corticosteroid to relief and prevent the recurrence of asthma attack. Patient's asthma exacerbated by crab allergy. It is important to differentiate accurately between shellfish allergy and other drug allergies or toxicities as their clinical presentations can mimic each other. Tropomyosin has been identified as the major allergen in the shellfish family and is responsible for the majority of the cross-reactivity observed. Counselling and drug related information must be given to the asthmatic patient which will prevent the serious of asthmatic attacks.

**Keywords:** Crab allergy, Tropomyosin, Radioallergosorbent test

### INTRODUCTION

Although asthma and allergies are two various conditions, asthma is a chronic disease of the bronchial air tubes, whereas allergies involve an overreaction of the body's disease-fighting immune system, where these two conditions can be intertwined and often overlap each other. Sea food is the common and well known food in the diet. It cause the symptoms ranged from oral allergy syndromes to urticaria and anaphylaxis. The major identified allergens are pravalbumin in fish and tropomyosin [1] in shell fish. Sea food allergy and drug allergy is not very common among children with asthmatic conditions. Penicillin allergy is seems to be very uncommon and the estimated frequency of anaphylaxis at 1-5 among 10000 patients who was on penicillin therapy [2]. The true incidence of allergy in patients with a history of penicillin allergy [3] is substantially less than 10%.

The consequences of IgE-mediated mast-cell activation mechanism maily due to the dose and route of antigen entry; various clinical symptoms appears such as irritating sniffles of hay fever, due to allergents which leads to the serious life-threatening circulatory collapse that develop in systemic anaphylaxis [4].

The most useful test for detecting IgE mediated drug reactions caused by penicillin and many large-molecular-weight biological is immediate hypersensitivity skin testing [5]. An occupational asthma affects patient of those inhaling crustaceans is more prevalent than bony fish and molluscs [6]. Some allergic patients when experiencing seafoods, they prone to different health problems, which include disorders related to gastrointestinal, urticaria, immunoglobulin E (IgE) mediated asthma and anaphylaxis. Raw and cooked seafood extracts are used to diagnose allergic sensitization in individuals by skin prick test.

### CASE REPORT

The patient was Malay, 8 years and 3 months female child with the height of 122cm, weight of 22.4 kg and BMI of 15.05, indicating that she was underweight. She was admitted into the ward early

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morning at HSAH hospital on 2014 October. She was brought to the causality with no cyanosis, and was able to speak little. Patient was generally alert and conscious. She was having shortness of breath and worsening by night, developed rashes over the oral, face body and limbs after eating crab meat at her friend's house. Her fast breathing was associated with wheezing and she denied any exposure to dust, cold weather or exercise. She has known history of penicillin allergy. She was given MDI Salbutamol 4hourly and MDI seretide at home, but symptoms still persist.

She was having the history of wheezing often. Patient has past medical history of asthma diagnosed at the age of 2 years old, allergic rhinitis and eczema. She does not have cold induced symptoms. Patient's mother reported her child have an allergy towards penicillin and crab. The past medication history includes MDI Salbutamol 4hourly, MDI Seretide, Tablet Lorathidine 5mg, Montelukast 5mg, Syrup Theophylline 50mg and Tablet Prednisolone. In her family history, her younger brother has bronchial asthma and not the parents and her father has the habit of smoking.

On the day of admission, patient's hydration was good. Physical examination was checked was shown equal air entry with right sided crepitations. Her CVS has shown DRNM, abdominal musculoskeletal is soft and not distended. The CXR shows clear lung field. The SPO<sub>2</sub> was 97% on air. The blood pressure was found to be 101/59 mm/Hg, PR 120/min, and temperature was 37.4°C, RR 32/min and pain score was 97. Physicians, after doing the necessary physical examination on patient and continuously monitored patient's heart rate, blood pressure, respiration rate. Patient was diagnosed with acute exacerbation of bronchial asthma with fast breathing needs to be solved immediately hence

The anti-asthmatic drugs were given along with corticosteroid to relief and prevent the recurrence of asthma attack. The blood pressure of the patient had the range of systolic BP: 95-112mmHg; Diastolic BP: 57-75 mmHg. On the first day of admission, the corticosteroid T. Prednisolone 25mg OD was started for 5 days and withhold MDI Salbutamol and MDI Seretide 25/125 2 puff BD. On the Second day till fifth day during hospital stay the tapering of T.Prednisolone was given as a plan are 25mg OD for 5/7 12n; 15mg OD for 3/7; 10 mg OD for 3/7; 5mg EOD for 1 week and this steroid tapering dose was instructed to the patient and mother by the respiratory team of the hospital and patient was assessed regarding the inhaler techniques by them.

Other medications such as T.Montelukast 5 mg ON at 10pm, Sy. Theophylline 50 mg BD (12N/12mn), T.Loratidine 5mg ON at 10pm and MDI Seretide 25/125 puff BD were continued to be given. Patient was better and discharged on fifth day from the hospital with discharged medications are MDI Seretide 25/125 at 12 hourly, MDI Salbutamol 4 puff 6hourly for 1 day; then 2 puff 6 hourly until cough reduced; then 2 puff PRN also tapering of T.Prednisolone 20mg daily for 3 days (from the day of discharge 5<sup>th</sup> day till 7<sup>th</sup> day, and then 15mg daily for 3 days (8<sup>th</sup> day till 10<sup>th</sup> day), 10mg daily for 3 days ( 11<sup>th</sup> day till 13<sup>th</sup> day), 5 mg for 3 days ( 14<sup>th</sup> day till 16<sup>th</sup> day), 5mg EOD for 7 days (17<sup>th</sup> day till 23<sup>rd</sup> day). Patient's past medications T.Loratidine 5mg ON and syrup. Moreover theophylline 50 mg, twice a day also advices to be continue. Follow up after 2 months.

## DISCUSSION

Patient was initially diagnosed and known illness of asthma. Patient's asthma exacerbated by crab allergy. Crab meat is rich in protein and when patient was ingested, the IgE recognized it on the surface of these cells; mediators histamines are released and symptoms occur. The symptoms of IgE-mediated reactions typically involve the skin, respiratory system and gastrointestinal tract [7]. Tropomyosin is the major allergen and is responsible for cross-reactivity between members of the shellfish family, particularly among the crustacean [8] species (including crawfish, crab and lobster). Some studies [9] shown children with seafood allergy have higher specific IgE antibody levels greater epitope diversity than in adults. The upper respiratory tract symptoms usually by sea food allergies are rhinitis, asthma, and anaphylaxis.

Food-induced asthma is an IgE-mediated illness which results from the consumption of a causative food or from the inhalation of vapors evacuated during cooking or in occupational settings. The prevalence of food-related asthma in the general population is unknown, but this illness has been found to occur in 5.7 percent of children with asthma [10]. RAST was done to this patient where the patient was experienced with serious reactions and asthma. But if patients have a history suggestive of food-related illness and tests for IgE antibody to the food are positive, the first course of action is to eliminate the food from the diet. Further testing is usually not needed in patients with severe, acute reactions. However, if symptoms are chronic (atopic dermatitis, asthma) or many foods are implicated, diagnostic oral food challenges may be necessary.

Patient was well assessed frequently for changes in the skin, gastrointestinal tract and respiratory system.

### **Table-1: General Diagnosis Approach of Food Allergy**

*Patient detailed history:* Rule out the causes of symptoms and formulate it is food allergy

*Evaluate IgE mediated or IgE non mediated food allergy:* Skin prick-puncture tests or Radioallergosorbent tests (RAST).

*Interpretation of test result:*

Positive Test: Avoid only food producing allergy

Negative Test: Reintroduce food

*Diagnosis & Treatment:* Medications: Monitor the patient frequently for changes in the skin, Gastrointestinal tract and respiratory system, Re-evaluate at appropriate intervals if tolerance likely.

#### *Drug Related Issues and Interventions:*

The clinical pharmacist supported the physician on every step of monitoring the patient's response of medications given during the hospital stay and solved all drug related pharmaceutical care issues which proved to be effective for the symptomatic treatment of asthma caused by crab food allergy. Loratadine is a long acting tricyclic antihistamine that selectively blocks peripheral histamine H<sub>1</sub> receptor activity. Loratadine may decrease the level or effect of prednisolone by P-glycoprotein (MDR-1) efflux transporter. Hence for the significant interaction if any was closely monitored for the patient. Where underdose of loratadine was given to the patient noticed and recommended to change dose to 10mg once daily under physician supervision. Prednisolone may decrease the level or effect of theophylline by affecting hepatic/intestinal enzyme CYP3A4 metabolism and thereby the patient was well monitored closely.

Theophylline is a narrow therapeutic drug not widely used in the treatment of childhood asthma [11], there is some improvement of symptoms and lung function with the use of intravenous theophylline in children hospitalized with a severe asthma attack. However, this therapy does not reduce the length of stay or the need for additional bronchodilator treatment, and it is not recommended for routine use. Hence the patient was not discharged with theophylline medication.

Oral theophylline initially given choice prophylactic treatment of childhood asthma. It proved to be less promising when its use over one year was compared with the use of inhaled corticosteroids. Although there was no significant difference between theophylline and inhaled corticosteroids in reduction of asthma symptoms, there was an increased use of short-acting beta<sub>2</sub> agonists and oral corticosteroids among children receiving theophylline [12].

In summary, its use in children cannot be recommended because of the potential for serious side effects, such as cardiac arrhythmias or convulsions, if therapeutic blood levels are exceeded<sup>13</sup>. It is very important a patient should immediately report signs/symptoms of theophylline toxicity (vomiting, arrhythmia, seizures); and patient must avoid abruptly discontinuing or changing dosage without supervision by healthcare professional.

Patient was received appropriate advice at the time of discharge about the medications, how to use it, precautions, self-monitoring for side effects. The Patient is being in use of nebulizer Salbutamol (beta agonist), on regard this medication use, counseled by pharmacist on at high dose can cause hypokalemia, avoid exceeding limit of drug administered to prevent adverse effects such as chest discomfort, hyperglycemia and upper respiratory inflammation.

Some of the non-drug related issues were informed to the patient such as knowledge on how to use metered dose inhaler is reviewed again, and patient is advised to do minimal exercises, avoid crowded place and anything that can exacerbate asthma. Avoid inhale or eat crab meat or any shell fish preparations. For family member who smokes in the house was advised not to do so.

#### *Pharmaceutical care and patient education:*

Pharmacists play an important role in providing pharmaceutical care by monitoring patient's response to drug, side effects etc. They educate on the *allergy* or referral if necessary. Pharmacists should routinely query about asthma when counseling on allergies to the patient. Effective counseling must be patient specific. Patient and the caregivers must be advised about the crab which is a shell-fish; its protein can become airborne during cooking and cause an allergic reaction. Some people may have a reaction from handling shellfish. Educate children with shellfish allergy not to accept food from classmates or friends. Within the shellfish family, it is the crustacean group (shrimp, lobster

and crab) that causes the greatest number of allergic reactions. Many shellfish-allergic people can tolerate mollusks (scallops, oysters, clams and mussels). A shellfish allergy is different from an allergy to fish. Pharmacists should also educate caregivers about, informing their children's allergies to their baby-sitters, teachers, and other caretakers.

### CONCLUSION

In conclusion this case study suggests that lack of awareness about allergens and the potential hazards from seafood in patient has been monitored. Every caregiver is responsible to educate their children and others. Asthmatic patients should be advised against any exposure. Asthma is a strong predisposing factor and should be well-controlled. It is important to differentiate accurately between shellfish allergy and other drug allergies or toxicities on patients as their clinical presentations can mimic each other but tropomyosin was proved to be the major allergen in the shellfish family and it is responsible for the cross-reactivity observed in many patients. We recommend providing frequent education to the asthma patients in the hospital and drug related information by distributing pamphlets, conducting audio visual talks, creating awareness about the allergens and foods which trigger occupational asthma can support them to get sufficient knowledge which will prevent the serious exacerbation of asthmatic attacks among patients.

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### REFERENCES

- [1] Q.Ashton Acton, Issues in Allergy and Asthma Research and Treatment; 2013, Page 73.
- [2] Sanjib Bhattacharya, The Facts about penicillin allergy: review, J Adv Pharm Technol Res. 2010 Jan-Mar; 1(1): 11–17.
- [3] Mel E Herbert, Ten percent of patients who are allergic to penicillin will have serious reactions if exposed to cephalosporins; West J Med. 2000 May; 172(5): 341.
- [4] Janeway CA Jr, Travers P, Walport M, et al, Immunobiology: The Immune System in Health and Disease. 5th edition, 2001.
- [5] Roland Solensky, David A. Khan, Drug Allergy: An Updated Practice Parameter; Annals of allergy, asthma and immunology, 2010,vol.105.
- [5] Daniel A Ramirez, Sami L Bahna; Food hypersensitivity by inhalation; *Clinical and Molecular Allergy* 2009, 7:4.
- [6] Bock SA, Atkins FM. Patterns of food hypersensitivity during sixteen years of double-blind, placebo-controlled food challenges. *J Pediatr*. 1990;117:561–7.
- [7] Chee K Woo, Sami L Bahna; Not all shellfish "allergy" is allergy; Clin Transl Allergy. 2011; 1: 3.
- [8] Ayuso R, Sanchez-Garcia S, Lin J, Fu Z, Ibanez MD, Carrillo T, Blanco C, Goldis M, Bardina L, Sastre J, Sampson HA. Greater epitope recognition of shrimp allergens by children than by adults suggests that shrimp sensitization decreases with age. *J Allergy Clin Immunol*. 2010;125(6):1286–1293.
- [9] Sicherer SH, Sampson HA. The role of food allergy in childhood asthma. *Immunol Allergy Clin North Am*. 1998;18(1):49–60.
- [10] Mitra A, Bassler D, Ducharme FM. Intravenous aminophylline for acute severe asthma in children over two years using inhaled bronchodilators. *Cochrane Database Syst Rev*. 2004;(4):CD001276.
- [11] Inkelman DG, Reed CE, Nelson HS, Offord KP. Aerosol beclomethasone dipropionate compared with theophylline as primary treatment of chronic, mild to moderately severe asthma in children. *Pediatrics*. 1993;92:64–77.
- [12] Siu SJ, Self TH, Burns R. Theophylline toxicity: update. *Ann Allergy*. 1990; 64(2 pt 2):241–57.