

Childhood asthma and dietary management among Singapore parents
Ang, K.L., & Foo, S. (2001) *Nutrition & Food Science*, 31(6), 319-335.

Childhood Asthma And Dietary Management Among Singapore Parents

Kai Ling Ang* and Schubert Foo**

(*) Science and Technology Education, National Institute of Education,
Nanyang Technological University, Nanyang Walk, Singapore

(**) Division of Information Studies, School of Computer Engineering
Nanyang Technological University, Nanyang Avenue, Singapore

Abstract

The devastating effects of asthma on children and the high reported incident rate of one in five children in Singapore has prompted this study to assess the diet among the children and understand the diet management practices of their parents. A survey questionnaire in three different languages was administered to 4680 primary school children's parents in 39 randomly selected primary schools to assess reported main triggers of asthmatic attacks, dietary and folklore practises among the parents of asthmatic children. A total of 4352 returns were obtained of which a total of 2067 asthmatic children were identified based on the criteria for diagnosis of asthma in the International Study of Asthma and Allergies in Childhood.

The findings found that 56% percent of parents reported that foods and drinks were the triggers of their children's asthma attacks. Almost 60% of these parents practice food restriction or avoidance, such as fruits, fruit juices, eggs, fish and milk, in an attempt to alleviate asthma symptoms. Additionally, 67% (n=1222) of these parents also believe in the use unproven Asian folklore to avoid asthmatic attacks on their children such as the intake of wild meats and pearls, and the use of reflexology and others. Based on these findings, it becomes apparent that there is a need to educate these parents on proper asthmatic management and good dietary practises in order to avoid nutrient deficiencies that can affect the children's growth.

Keywords *asthmatic children, Singapore, parents, food restriction, folklore*

Introduction

A study conducted in Singapore found the incidence of asthma among Singaporean children to be as high as one in five (Goh *et. al.*, 1994). Such incidence rate was also reported in the United Kingdom (Speight *et. al.*, 1983). They found that by the age of ten, at least 20% of all children will, at some time or other, have had symptoms of underlying asthma. Asthma has also been found to be the most common chronic disease in children affecting 7% to 10% of preschool children in the United States (Peterson, 2000). This finding was also confirmed by the U.S. Department of Health & Human Services who also found that asthma is the leading cause of school absenteeism (Ukens, 1999)

In asthma, the airway epithelium is often damaged. This reduces the efficiency of ciliary actions and therefore contributes to the pooling of secretion within the lungs. Children's airway diameter is considerably smaller than in adults, so when there is a bronchoconstriction, the resistance to airflow is inevitably higher. This often leads to hyperinflation in order to meet the increased oxygen demand (Lenny and Milner, 1983).

Careful epidemiological studies that have been repeated after an interval of 15-30 years have shown that there is an increase in both the prevalence and severity of asthma in many parts of the world (Roberts *et. al.*, 1991). The reasons remain obscure, but many suspect that environmental factors are responsible for these changes. In fact, there are multifactorial causes of asthma. The common triggers of asthmatic symptoms in children are well established in many studies and include mainly those of bronchial viral infections, pollution, dust, mites, pollens, stress and some food allergens, such as royal jelly (Berkovitch *et. al.*, 1970, Wilson *et. al.*, 1985, Steinman *et. al.*, 1986, Thien *et. al.*, 1993, Bollock *et. al.*, 1994).

Although asthmatic symptoms are usually temporary, the repetitive nature of the condition and the devastating effects it has particularly on children, warrant it to be better understood and properly managed. A literature search on a number of online databases, including ProQuest and Medline, recorded many studies on asthma but they were related to environmental triggers, social, genetic factors and drugs treatment. Others studies were related to food sensitivities such as food additives like colouring agents, preservatives, citric acid, and flavoring agents. Studies done at allergy clinics for treating asthmatic children found symptoms of asthma to be triggered off due to allergy of beef and cow's milk (Fuglsang *et.al.*, 1994; Werfel, *et. al.*, 1997). Allergic diseases, particularly asthma, were also caused by the early introduction of certain foods (Lorente, *et. al.*, 1998).

However, few studies have so far been done on diet practises or restriction among parents of asthmatic children (Ford *et al.*, 1989, Dawson *et al.*, 1990). In Singapore, it is a rather common practice among parents to restrict or abstain certain foods and beverages on their asthmatic children. In addition, some parents have known to apply folklore remedies in an attempt to curb asthma attacks on their children. The major aims of this study are to determine the extent of dietary restriction management among these parents, their assessment of asthmatic triggers in food given to their children, and the application of

folklore remedies. This paper will highlight these major findings. These findings would have important implications since inappropriate diet restriction or avoidance can lead to malnutrition and even affect children's growth (Labib et. al., 1989).

METHODOLOGY

A total of 39 randomly selected primary schools with school children ages ranging from 7 to 12 were sampled. A survey questionnaire in three different languages, namely, English, Mandarin and Malay (Appendix 1) was administered to parents of these randomly selected students of all levels. This was to cater to the different language background of the parents to assist them complete the questionnaire using their preferred language and to avoid or minimise misinterpretation of the questions.

Section A recorded the demographic data and Section B of the structured questionnaire is used to isolate the actual asthmatic cases among the respondents. Although, it remains impossible to reach a universal consensus on a precise definition for asthma condition (Scadding, 1983), the criteria or diagnosis of asthma adopted in this study was based on the questionnaire used in the International Study of Asthma and Allergies in Childhood (ISAAC, 1992) that identified symptoms of persistent cough, wheezing and/or breathlessness.

Sections C of the questionnaire sought to establish the main triggers of asthma symptoms, the type of food and beverages that were believed to trigger asthma symptoms, detecting the presence of any confirmatory tests of these 'triggers', the prevalence of dietary restrictions imposed by parents of asthmatic children in order to avoid asthmatic attacks and sources of information for such practises. This section also sought to identify if any supplements were given and the types of supplement and food given to their children in order to avoid asthma attacks and the sources of these information.

Section D of the questionnaire sought to elicit the existence of any traditional or folklore remedies used in managing asthma and the sources of such advise. This section also sought to find out how parents rate various asthma management approaches.

Section E established family history of asthma, breast-feeding and weaning practises.

RESULTS AND DISCUSSION

A total of 4680 primary school children were surveyed. This represented a very good response of 93% with 4352 returns. Demographic and social-economic distribution of respondents were representative of Singapore families as shown in Table 1. The Statistical Package for Social Science (SPSS) was used to analyse the returns and to generate statistics for the findings. The major findings from the survey are elaborated in the following sections.

Table 1. Demographic profile and social-economic categories of study population (N=4352)

Race	Malays	Chinese	Indians	Others	No answers
Percentage	14.5	70.4	9.1	4.4	1.6

Education Level	PSLE (Primary)	GCE 'O' levels (Secondary)	GCE 'A' levels (Pre-University)	Diplomas, University and Post-graduate qualification (Tertiary Education)	Others
Percentage	23.2	40.7	10.8	19.3	5.9

Monthly Income	<\$1000	\$1000- \$1999	\$2000 - \$3999	>\$4000	Not Indicated
Percentage	16.9	31.6	15.4	33.1	3.1

Table 2. Reported Triggers of Asthma Attacks (N=4352)

Infection (e.g flu)	Food and drinks	Weather (e.g cold weather)	Exercise	Pollution (e.g dust, smoke)	Fur/feather from animals
59 % (n=1218)	56% (n=1164)	51% (n=1056)	35% (n=726)	50% (n=1045)	35% (n=725)

Table 2 summarises the main asthma triggers. This is in the order of infection, foods and drinks, changes in weather, exercise, pollution such as dust and smoke and fur/feather from animals. It is interesting to note that the prevalence of exercise-related symptoms exacerbation is comparable to that previously reported by Goh *et. al.* (1994).

Infections

The most frequent trigger of asthma reported by this group of parents is infection. Infections are well known to be the primary exacerbating factor in childhood asthma. This is particularly true with viruses and *Mycoplasma pneumoniae* (Berkovitch, Millian & Snyder, 1970). Viral respiratory infections provoke wheezing in patients with existing asthma (Busse, 1991). Clinical evidence suggests that some patients develop asthma following an uncomplicated viral respiratory illness. There are also a number of studies showing that babies who have acute viral bronchiolitis will often have recurrent attacks of coughing and wheezing for the next 3 to 5 years (Webbs *et. al.*, 1985). It has been calculated that about 20% of all wheezing attacks in the first five years of life are the result of previous attacks of acute bronchiolitis (Milner, 1993)

Table 3: Reported foods and beverages as exacerbators of asthma

	Type of food and beverage	Percentage reported (%)	n
1	Iced water, ice-cream	100	1226
2	Fizzy drinks	93	1143
3	Fresh fruit juices	76	928
4	Cold/chilled foods	79	964
5	Fruits	69	843
6	Chocolates	68	833
7	Food additives	66	812
8	Sweets and sweet food	64	789
9	Nuts	57	701
10	Milk/diary products	49	605

Interestingly, food and beverages is the second most frequent trigger reported by this same group of parents. Over half (59%, n= 1228) of those surveyed reported different kinds of foods and drinks as exacerbators of asthma with the top 10 exacerbators shown in Table 3. This is a relatively much higher percentage compared to overseas' populations. Wilson *et. al.* found this value to be 18.6% among his sampled parents with asthmatic children in asthmatic clinics and hospitals in London (1985) while Ang found it be 19.7% in a similar study conducted in central London (1993). Reports of food related asthma has also been previously reported in Asian children, more so than non-Asian children (Wilson *et. al.*, 1985)

All 100% (n=1226) of parents surveyed in this study reported that iced water and ice-cream provoked their children's asthma. The next common items reported were fizzy drinks (93%, n = 1143), cold/chilled foods (79%, n = 964), fresh fruit juices (76%, n = 928) and fruits (69%, n = 843). The rest of foods/drinks reported, in order of decreasing frequency, were chocolates, food additives, sweets and sweet foods, nuts and milk/dairy products.

While Wilson *et. al.* (1982) has found that there is an increased bronchial responsiveness caused by ingestion of ice, however, this may not be the direct cause of asthma attacks. Likewise, in another of Wilson's study (1985), cola and other fizzy drinks increased sensitivity of the airways. However, exposure to only a single stimulant may not be sufficient to exacerbate the asthma. Added triggers may start the attack. Steinman *et. al.* (1986) who conducted a study on the effects of soft-drink preservatives on asthmatic children, had shown that it was not the beverage that cause the asthmatic symptoms, but rather the presence of additional stimuli, such as cold air or physical strain(exercise), as the airways and lungs become more sensitive with these beverages. This can be illustrated in the "asthma barrel" effect as shown in Figure 1. For example, a brief football game during school recess may not immediately trigger an asthma attack, but drinking from the cold water cooler and sitting under the fan to cool down, after the game, may start the asthma.

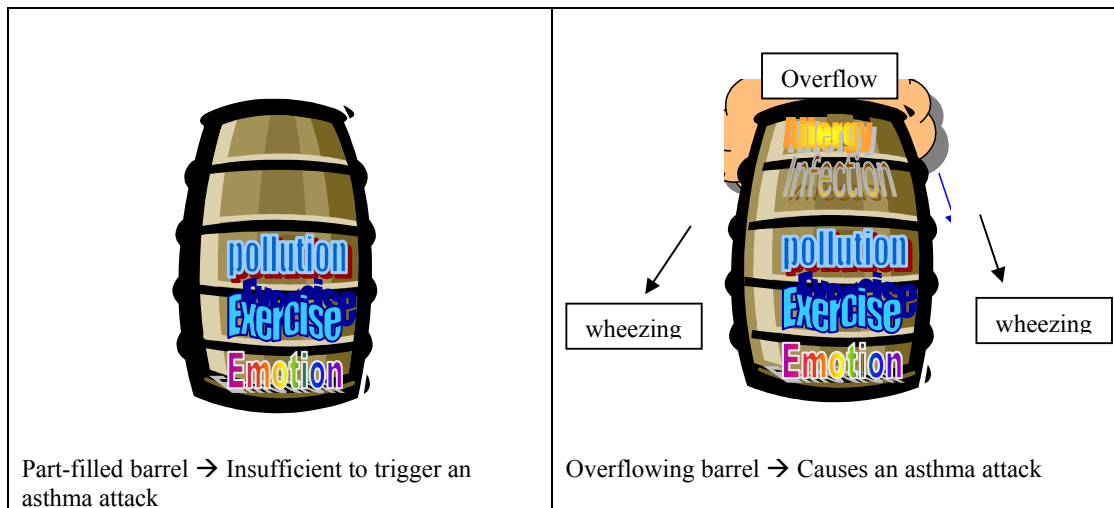


Figure 1. Asthma barrel effect

Diagnosis of Food Triggers

The major manifestations reported after ingestion of these foods and drinks include coughing (95%, n = 1105), wheezing (57%, n = 542), and shortness of breath (27%, n = 318). The time of onset of reactions from the ingestion of foods or beverages was, within a few minutes in only 8% (n = 95) of subjects surveyed while over 27% (n = 313) could not recall the interval. Thirty-five percent (35%, n = 409) even reported reactions within a few days! This is rather interesting as allergic reactions would largely be of the hypersensitivity reaction and would classically manifest within minutes, whereas a delayed manifestation may indicate alternative mechanisms (Chen *et. al.*, 1993). Although these reactions were reported to have been confirmed by family doctors in most of the cases (35%, n = 411) or specialist doctors (13%, n = 149), only 5% of them had any confirmatory test done (e.g skin prick test or blood allergy test).

Diet Management

Almost 60% (n = 1210) of these parents of asthmatic children practice food restriction or avoidance, at some time, in the attempt to alleviate asthma symptoms. Of these, 16% (n = 192) avoid certain foods and drinks totally and at all times; while 23% (n = 278) allow these 'trigger' foods and drinks when the child is fairly well symptomatically; and over 53% (n = 648) abstain from these foods, except on special occasions such as birthdays.

This indicates that a fairly significant group of parents actually do exercise food avoidance or dietary alteration in their child because of asthma. Avoiding or restricting cold fizzy drinks, ice-cream or sweets, from the nutritional perspective, are not so of a concern. What is most worrying are the fruits and fruit juices, which happen to be among the top 5 foods that they remove from their children's diet. Fruits and fruit juices are rich in vitamin C which in many studies have found to build-up resistance against transient

respiratory diseases (which is one of the causes leading to asthma wheezing)(Bucca *et al.*, 1992). Removal of fruits from the diet may also result in a reduction in dietary fibre intake. It is not clear if these children are consuming and enjoying plenty of vegetables when fruits are removed from their diet.

Most of these parents practice such diet management out of their own experience and initiative (45%, n = 548) or based on advice from friends and relatives (37%, nn = 443). Interestingly, 62%(n= 751) reported that they do so under the advice of their doctors. It is understandably that parents are anxious and may be frustrated by the constant reliance on drugs in the management of their children's asthma. Hence, they take their chances to trial and error in managing their children's asthma.

Despite dietary alteration, 52% (n = 623) of them believed that their child's diet was nutritionally well-balanced. Thirty-two percent (n = 387) were, however, unsure of any nutritional deficiency.

Almost half (45%, n = 925) of the parents surveyed did provide their asthmatic child with some vitamins or mineral supplements. This was intended to compensate for the dietary restrictions imposed on the child (23%, n= 214), to remedy the child's "weakness" (23%, n= 212) or for no particular reason (25%, n= 230). The list of supplements include garlic pills, evening primrose oil, chicken essence, royal jelly, ginseng, chlorella and barley. Besides not having any proven value, some of these 'supplements' may in fact cause adverse effects, such as royal jelly. Precipitation of asthma by royal jelly has been reported in many cases (e.g. Thiel *et. al.*, 1993; Chen *et. al.*, 1993). Furthermore, fibre and protein removed from the diet cannot be replaced by supplements.

Also, quality protein from milk/dairy products, eggs and fish, that are restricted or removed may not be sufficiently replaced by the supplements such as chicken essence. Certainly ginseng, chlorella, garlic pills and evening primrose oil, do not have the necessary protein to replace them.

The source of information on food supplements was largely derived from friends and relatives (13%), doctors (14%), or their own initiative (19%). The role of mass media in this area is much less with only 2%, 3% and 4% reportedly derived from radio, television and newspapers, respectively. This observation may reflect a general lack of nutritional knowledge among Singapore parents.

Furthermore, parents of asthmatic children are also of the opinion that some foods are important and should be consumed to avoid asthma symptoms. Sixty-seven percent (n = 1222) of parents surveyed believed that wild meats (of crocodiles, bats, foxes, iguanas, turtles, pigeons, dogs, rabbits, frogs and camel's liver); Chinese herbs (ginseng, cordycep, bird's nest, pearls); durians, ginger-water and almond soup); have positive effects on their children's asthma. This reflects a high prevalence of folklore therapy and beliefs, amongst the Singaporean parents. There have been no vigorous scientific reports that these wild meats provide a higher biological valued-protein than the common and easily accessible chicken, fish, egg or milk.

If foods are restricted and the nutrients in those foods were not replaced from other sources, children may be at risk of nutritional deficiency which can affect their growth, as demonstrated in Labib et al's case study (1989). In this study, a 4 year-old boy was investigated for short stature as he was given a restricted diet with cow's milk, dairy products, goat's milk, eggs, chocolate, sugar, food additives, fish, beef, lamb and pork withdrawn, for purported food sensitivity. After eight weeks of normal diet including cow's milk was reintroduced, he gained 1.5 kg in weight and 2.0cm in height.

In this survey, it is noted that some of these Singaporean parents of asthmatic children administer other forms of therapy too. These include reflexology (5%, n = 103), aromatherapy (5%, n = 97) and acupuncture (2%, n = 41). Some studies reported that aromatherapy reduce anxiety and patients were more positive after the therapy (Dunn *et. al.*, 1995). Milner (1993) reported that some herbal cures as such can be effective, but they act on central nervous system rather than any local effects in the lungs. Many such homeopathy treatments have no control trials to verify, hence, the positive results could be due to 'placebo' effect. Another study reported a 53-year-old been diagnosed having allergic airborne contact dermatitis due to a year-long exposure to lavender, jasmine and rosewood (Schaller and Korting, 1995). Although this study cited only one incident, there is a likelihood that we may not be aware of other similar cases that are diagnosed but not reported.

DISCUSSION AND RECOMMENDATIONS

The information provided in this survey, depended on memory in some cases and on subjective interpretations of asthma and food "triggers" in others. Nevertheless, the results indicated a significant proportion of parents of asthmatic children, feel that food or drinks do affect their child's asthma. A great majority of them practise dietary restrictions or alterations, in managing their child's asthma, unwittingly not knowing what nutrients their children may be lacking. Perhaps, one way to convince parents without unpleasant confrontation, not to practise self-administered dietary restriction, is to have a food challenge done as David (1981) had done. David conducted a double blind challenge with tartrazine and benzoic acid on 24 children whose parents gave a definite history of a purely behavioural immediate adverse reaction to one of these additives. They were on a diet free of these items and no patient was observed with any change behaviour after the administration of placebo or active substances. Twenty two of them returned to normal diet without problems while the other 2 insisted on continuing the diet. Similarly, objective verification is therefore required in order to prevent unnecessary food restriction or avoidance in these asthmatic children.

A significant 88% (n= 1060) of those who practice dietary alteration, reported a noticeable improvement in their child's asthma. However, such observations may not be objective, as they are concluded without the health professionals' assistance. They may discover otherwise, like in the David's case, once a food challenge is conducted.

Parents of asthmatic children restrict their children's diet mainly taken on their own initiative. Many claimed to have been advised to do so by their doctors. In order to avoid

unnecessary nutrients deficiency with such self-administered dietary restriction commonly adopted, an effective dietary education campaign is needed to reach both the parents and doctors. Many of the Singapore doctors are not trained nutritionists or dieticians. As primary health care professionals, they too should better acquaint themselves in nutrition, before giving advise to their patients or refer them to the relevant professionals.

Seminars and workshops can be conducted in schools, clinics, hospitals and community centers or clubs, to provide parents good knowledge about the possible triggers of asthma, exercises to strengthen their children's immunity and lungs. It is important to stress the 'barrel' effect of asthma attacks so as to avoid unnecessary restriction or avoidance of exercises and food. Good dietary practices using the Food Guide Pyramid to help them plan their children's meals, will further equip them with confidence in coping with their asthmatic children.

Supportive groups and hotlines are also good alternatives to provide efficient support to such parents. These avenues can help to prevent undue anxieties and unnecessary food avoidance practices.

The Singapore Asthmatic Association (SAA) can play a helpful role in providing the psychological and emotional support too. SAA can organise nutrition workshops to help parents in better understanding their children's diet and subsequently planning their healthful diet. Self-help groups consisting parents of asthmatic children can also be organised to provide morale encouragement and support. Exercise rehabilitation programmes that strengthen the lungs and chest muscle can also be introduced as another healthful management strategy. Hotlines provided by asthma clinics and hospitals can also be very helpful.

Schools can also consider incorporating exercise rehabilitation for asthmatic children in the form of Extra Curriculum Activities. Installing asthmatic First Aid kits and having teachers trained about asthma management and to keep a look out for these children (American Academy of Pediatrics, 2001). It is noted that a large number of Olympic athletes and other top sportsmen and women are asthmatic. As long as their asthma is well controlled, there is no reason to stop an asthmatic child from helpful exercises. (Marton, 1994). To reinforce the above, specific instrumental messages can be printed on pamphlets to be distributed at public avenues.

Childhood asthma generally tends to improve with time. Those wheezing without obvious allergic triggers in the first few years of life, may well be asymptomatic, by the age of six or seven years, and even those with obvious atopy are likely to improve by or during adolescence (Milner, 1993). There are now a number of epidemiological studies on the natural history of wheezing and coughing after bronchiolitis, indicating that 80% will have symptoms in the two years after the acute attack (Webbs *et. al.*, 1985), but of these less than half will still have symptoms by the time they reach the age of five years, and less than 20% by the age of ten years (Pullan, 1982).

However, in the process of ‘growing out’ of asthma, the extent of dietary restriction and the types of restriction, may have a great effect on the children’s growth. Asthma was found to have no direct influence on growth in height, but was associated with delay in the onset of puberty (Balfour-Lynn, 1986). But once puberty finally began, complete catch up growth resulted in the attainment of the predicted adult height. The pre-adolescent physiological deceleration of growth velocity that occurs in these children gives the impression of growth retardations. Hence, like the case in the Labib study, parents may be over-anxious about the child’s below average stature of height and weight, even though his rate of growth was normal. Furthermore, nobody would like to grow up from a childhood with severely restricted diet and games (some parents also restrict children from running too much), while seeing their peers enjoying themselves.

Besides drugs and dietary management, non-pharmacological means of preventing asthma could be simple and effective. Cessation of smoking in the home is one of the most important actions recommended (Price, 1990). There is a highly significant increase in wheezing, coughing and respiratory infections in children with smoking mothers. Core blood IgE levels are increased in babies whose mothers smoke during pregnancy. Other environmental agents such as chemical pollutants from industrial processes play a role in the development of asthma symptoms and should be avoided. Avoiding allergens at home, such as dust mites, pets etc, with constant Hoovering under the beds and sofa. Other means of reducing the chances of asthma attacks, where some people found them to be effective include those of adding a plastic sheet below the mattress or using ionizers.

Awareness of environmental conditions that hinder breathing in children with asthma is a key to effecting good control of the disease. One way to improve the health of young children is to reach out to day care centres. A great majority of Singapore mothers are working, and thus children typically spend 20% to 30% of their lives (and the majority of their waking time) at a day care facility. It is therefore important that care-takers pay attention in reducing potential allergens such as stuffed animals and have sound nutritional knowledge such that undue dietary restrictive management is not practised.

With the increasing orientation towards ‘natural’ modes of treatment, it is not surprising to find many of these parents, adopted therapy such as reflexology, aromatherapy, herbal folklores or acupuncture. Such self-medication, without the purported supervision from the medical profession, presents a risk in their children’s health or even their lives.

CONCLUSION

When asthma is not managed properly, children frequently miss school and are unable to participate in sports and other activities. Although medications can provide symptomatic relief and ease the inflammation of irritated airways, comprehensive asthma care includes more than drugs.

Although information given in the survey study depended on memory in some cases and retrospective interpretation of asthma/food allergy by the person who filled up the questionnaire, nevertheless, the results indicated that a great majority of parents were

uncertain about their children's diet and pediatric asthma. It is recommended that an effective and aggressive dietary education campaign in coping with asthma be launched along the proposed content guidelines. A separate detail food challenge study can also be undertaken to further confirm the parents' belief and to hopefully change their unnecessary dietary avoidance practices.

References

American Academy of Pediatrics (2001). How Asthma- Friendly is your school? www.schoolhealth.org/nasthma1.htm [Visited 3 July 2001]

Ang K.L. (1994) "Childhood Asthma – what teachers need to know", Teaching and Learning, Singapore, Vol 17 No1, pp.2- 14.

Balfour-Lynn L. (1986) "Growth and Childhood asthma", *Achives Diseases Childhood*, Vol 61, pp.1049-1055.

Berkovitch S., Millian S.J., Snyder R.D. (1970) "The association of viral and mycoplasma infections with recurrence of wheezing in the asthmatic child", Annual Allergy, Vol 28, pp.43-49.

Bollock R.J., Rohan A., Straatmans J.A. (1994) "Fatal Royal Jelly-induced asthma", Medical Journal of Australia 1994; Vol 160 No 1, pp. 44.

Bucca C., Rolla G., Farina J.C. (1992) "Effects of vitamin C on transient increase of bronchial responsiveness in conditions affecting the airways", Annals New York Academy of Sciences, Vol. 669, pp.175-186.

Busse, W.W.(1991) "Viral infections and allergic disease", Clinical and Experimental Allergy, Vol 21, pp. 68-69.

David T.J. (1987) "Reactions to dietary tartrazine", Achives Disease Childhood, Vol 62, pp. 119-122.

Dawson K.P., Ford R.P.K., Morgridge R.N. (1990) "In Practice Childhood asthma: What do parents add or avoid in their children's diets?", New Zealand Medical Journal, Vol. 103, pp. 239-240

Dunn C., Sleep J., Collett D. (1995) "Sensing an improvement: an experimental study to evaluate the use of aromatherapy, massage and periods of rest in an intensive care unit", Journal of Advance Nursing, Vol 21 No 1, pp. 34-40.

Ford R.P.K., Dawson K.P., Mogridge N. (1989) "Children's diets: what do parents add and avoid?", New Zealand Medical Journal, Vol 102, pp. 443-445.

- Fuglsang G., Madsen G., Halken S., Jorgensen S., Ostergaard P.A., Osterballe O. (1994), "Adverse reactions to food additives in children with atopic symptoms", *Allergy*, Vol 49 No 1, pp. 31-37
- Goh D.Y.T., Lee B.W., Chew F.T, Quek S.C. and Quek C.M. (1994) "Prevalence of childhood asthma in Singapore - Preliminary findings", *Journal of Singapore Paediatric Society*, Vol 36 No3/4, pp. 147-152.
- ISAAC Co-ordinating committee (1992). *Manual for the International Study of Asthma and Allergies in Childhood (ISAAC)*, ISAAC Co-ordinating Committee, Bochum and Auckland.
- Labib M., Gama R., Wright J., Robins D. (1989) "Dietary maladvise as a cause of hypothyroidism and short stature", *British Medical Journal*, Vol 298, pp. 232-233.
- Lenny W., Milner A.D., (1983). "At what age do bronchodilators work?", in Clark, T.J.H. and Godfrey, S.(Ed), *Asthma*, 2nd edition, Chapman and Hall, London, pp. 1-11.
- Lorente F., Romo A., Laffond E., Davila I., (1998) "Preventive measures for allergic diseases", *Allergol Immunopathol*, Vol 26 No 3, pp. 101-113.
- Milner A (1993), *Childhood Asthma: Diagnosis, treatment and management*, M. Dunitz, London, Chapter 1, pp. 3.
- Morton A.R. (1994) "Exercise and Asthma: What the physical education teacher should know", *Singapore Journal of Education*, Vol 14 No 2, pp. 49-57.
- Petersen, C.(2000) "The villain behind childhood asthma attacks is all around us", *Managed Healthcare*, Vol 10, pp. 42-44.
- Price JA. (1990) "Norpharmacologic means of preventing asthma", *Lung*, suppl., pp.286-291.
- Pullan C.R., Hey E.N. (1982) "Wheezing, asthma and pulmonary dysfunction ten years after infection with respiratory syncytial virus in infancy", *British Medical Journal*, Vol 284, pp. 1665-1669.
- Ramanoelina A.R., Terrom G.P., Bianchini J.P., Coulanges P.(1987) "Antibacterial action of essential oils extracted from Madagascar plants", *Archives Institute of Pasteur Madagascar*, Vol 53 No1, pp. 217-226.
- Scadding J.G., (1983). "Definition and clinical categories in asthma" in Clark T.J.H., Godfrey, S.(Ed), *Asthma*, 2nd edition, Chapman and Hall, London, 1-11.
- Schaller M., Korting H.C.(1995) "Allergic airborne contact dermatitis from essential oils used in aromatherapy", *Clinical Experimental Dermatology*, Vol 20 No2, pp.143-145.

Speight A., Lee D.A., Het E.N., (1983) "Underdiagnosis and undertreatment of asthma in childhood", *British Medical Journal*, Vol 286, pp. 1253-1256.

Steinman H.A., Weinberg E.G.(1986) "The effects of soft-drink preservatives on asthmatic children", *South African Medical Journal*, Vol 70, pp. 404-406.

Thien F.C., Leung R., Plomley, Weiner J., Czarny D.(1993) "Royal Jelly-induced asthma", *Medical Journal of Australia*, Vol 159 No 9, pp. 639.

Ukens, C.(1999) "AphA testing pediatric asthma care program", *Drug Topics*, Oradell; Vol. 143 No 19, pp.34.

Webbs M.S.C., Henry R.L., Milner A.D., Stokes G.M., Swarbrick A.S.(1985) "Continuing respiratory problems three and a half years after acute viral bronchiolitis", *Archives Diseases Childhood*, Vol 284, pp.1665-1669.

Werfel S.J., Cooke S.K., Sampson H.A. (1997) "Clinical reactivity to beef in children allergic to cow's milk", *Journal of Allergy Clinical Immunology*, Vol 99 No 3, pp. 293-300.

Wilson N. (1985) "Food related asthma: A difference between two ethnic groups", *Archives Diseases Childhood*, Vol 60, pp. 861-865.

Wilson N., Vickers H., Taylor G., Silverman M.(1982) "Objective test for food sensitivity in asthmatic children: increased bronchial reactivity after cola drinks", *British Journal of Medicine*, Vol 284, pp.1226-1228.

Wilson N.M., Dixon C., Silverman M.(1985) "Increased bronchial responsiveness caused by ingestion of ice", *European Journal of Respiratory diseases*, Vol.66, pp. 25-30.

Appendix 1

Questionnaire: Study On Food And Childhood Asthma

Instructions:

Please circle only one answer for questions with more than one response unless otherwise instructed
Please fill in the blanks when required

Today's date: ____

SECTION A: DEMOGRAPHIC DATA

1. Relationship to the child: father/mother/guardian
2. Your age: ____ 3. Age of child: ____
4. Race: (1) Chinese (2) Malay (3) Indian (4) Others
5. Is your child a vegetarian?
 - (1) Yes, excluding eggs only
 - (2) Yes, excluding eggs and dairy products
 - (3) Yes, includes eggs and dairy products
 - (4) No
6. Your highest education achieved:
 - (1) PSLE
 - (2) 'O'Level
 - (3) 'X Level
 - (4) Diplomas
 - (5) University
 - (6) Postgraduate studies
7. You and your child live in...
 - (1) HDB 1 or 2 room
 - (2) HDB 3 room
 - (3) HDB 4 room
 - (4) HDB 5 room or executive flat
 - (5) Private apartment/condominium
 - (6) Terrace
 - (7) Semi-detached/bungalow
8. Family income:
 - (1) less than S\$1000 per month
 - (2) S\$1999 per month
 - (3) S\$3999 per month
 - (4) more than \$4000 per month
9. Contact number (optional, for clarification only): ____

SECTION B:

10. Has your child ever had asthma? (1) Yes (2) No
- 10a If yes, how long has your child had asthma? ____ months
11. Has your child had a persistent dry cough at night, apart from the times when he/she had a flu?

(1) Yes (2) No

12. Has your child ever had wheezing or whistling noise in the chest at any time in the past?

(1) Yes (2) No

13. Has the child's chest sounded wheezy or whistling during or after exercise

(1) Yes (2) No

13a. Please circle one relevant responses pertaining to your child's asthma.

(i) his/her asthma attacks (1) No attacks
(2) less than once a month
(3) more than once a month but less than weekly
(4) weekly or more

(ii) he/she gets night coughs (1) No night coughs
(2) less than once in 2 months
(3) more than once in 2 months

(iii) in between attacks, he/she has (1) no symptoms
(2) symptoms occasionally

13b. Which of the following treatment is your child being given?

(1) none at all
(2) only given medication when symptomatic
(3) on regular medication and compliant (follow strictly)
(4) on regular medication but not compliant

If your answer to any of the above question is YES, please proceed with the rest of questions. If ALL your answers are NO, you may stop here. Thank you for your assistance.

SECTION C:

14. Are the following, common triggers of asthma attacks in your child?

Infection (e.g flu) (1) Yes (2) No
Foods and drinks (1) Yes (2) No
Weather (e.g cold weather) (1) Yes (2) No
'Exercise (1) Yes (2) No
Pollution (e.g dust, smoke) (1) Yes (2) No
Fur/feather from animals (1) Yes (2) No

15. Are there any food or drinks which trigger asthma attacks in your child?

(2) No, please proceed to question 19

(1) Yes, please grade their effects according to the scale given, by circling the right number as shown in the example below.

	No effect	A lot
Example: Rice	0 ----- 1 ----- ② ----- 3 ----- 4 ----- 5	

Ice water, ice-cream, yoghurt 0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Fizzy drinks 0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Fresh fruit juices 0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Milk/diary products 0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5

Chocolates	0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Eggs	0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Nuts (e.g peanuts, cashew nuts)	0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Shell seafoods (e.g prawns, crabs,clams)	0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Artificial additives and colourings (e.g spices, cakes, canned fruit drinks)	0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Chicken	0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Beef	0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Pork	0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Mutton	0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Fish	0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Wheat products (e. g bread)	0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Sweets and sweet foods	0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Fruit (please specify: . ___)	0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Cold and chilled foods (e.g salad)	0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Other foods, (please specify: ___)	0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5
Other drinks (please specify: ___)	0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5

16. What are the reactions after taking these foods?
(Can circle more than one)
- (1) coughing
 - (2) wheezing
 - (3) shortness of breath
 - (4) rashes or itching
 - (5) swelling around the eyes or mouth
 - (6) none at all
- 16a. On average, how long after ingestion of food do the reactions occur ?
- (1) Within a few minutes
 - (2) Within one hour
 - (3) Within a few days
 - (4) After a few days
 - (5) Not sure
17. How was this reaction to food or drinks diagnosed?
Please circle the relevant ones.
- (1) family doctor
 - (2) specialist doctor
 - (3) dietitian/nutritionist
 - (4) own observation
18. If diagnosis has been confirmed by test, what test were used ?
- (1) Skin prick test
 - (2) Blood test (Radioallergosorbent test)
 - (3) Food elimination/challenge
 - (4) Not clear
 - (5) Others, please give details _____
19. Do you avoid any foods/drinks in your child's diet in order to prevent asthma attacks?
- (1) Yes
 - (2) No, go to **question 24**

If yes to question 19, answer the following questions:

20. If yes, what are these foods/drinks? Please list them.

21. How often do you let your child consume these foods/drinks?
(1) Not at all
(2) At times only (e.g on special occasions)
(3) Only when they are not sick.
(4) Others, please specify . ____
22. Where did you obtain such information about foods and asthma?
Please circle the appropriate ones.
- (1) own initiative
(2) newspapers
(3) magazines
(4) TV
(5) radio
(6) doctors
(7) nurses
(8) dietitians/nutritionists
(9) friends and relatives
23. Have you noticed any reduction in asthma attacks as a result of restricting/avoiding these foods?
(1) Yes
(2) No

24. Are there any foods/drinks which you think in general are bad for your asthmatic child and should be avoided although they do not produce any specific reaction?
(1) No
(2) Yes, what are they? And answer question 24a.

- 24a. Where did you obtain this information ?
Please circle the appropriate ones.
- (1) own initiative
(2) newspapers
(3) magazines
(4) TV
(5) radio
(6) doctors
(7) nurses
(8) dietitians/nutritionists
(9) friends and relatives
25. What do you think of your child's diet? Please circle **ONLY ONE**.
- (1) nutritionally well-balanced: any foods restricted/avoided are replaced
(2) nutritionally adequate although some foods are avoided/restricted

- (3) not sure
- (4) may be short of some important nutrients
- (5) may be short of some less important nutrients

26. Do you provide your child any vitamins or mineral supplements?

- (1) Yes
- (2) No

If yes to question 26, answer the following questions:

26a. What types?

—

26b. and why? (Circle ONLY one response)

- (1) to compensate the foods/drinks restricted or avoided
- (2) because my child is weak
- (3) no particular reason
- (4) others, please specify: ____

26c. When do you give your child these supplements? (Circle ONLY one response)

- (1) when you feel they have been eating badly
- (2) when you feel they are not well
- (3) others, please give details . ____

26d. How often do you give your child these supplements? (Circle ONLY one response)

- (1) regularly, daily
- (2) regularly, once a week
- (3) regularly, once a month
- (4) regularly, please specify frequency : ____

27. Are there any foods which you think it is particularly important that your child should eat in order to avoid asthma attacks?

- (2) No
- (1) Yes, please give details

—

27a. Where did you obtain this information? Please circle the appropriate ones.

- (1) own initiative
- (2) newspapers
- (3) magazines
- (4) TV
- (5) radio
- (6) doctors
- (7) nurses
- (8) dietitians/nutritionists
- (9) friends and relatives

SECTION D:

28. What other forms of treatment do you think is eneficial to your child's asthma?

(More than one responses allowed)

- (1) accupunture
- (2) reflexology

- (3) aromatherapy
- (4) traditional herbs
- (5) others, please give details: ____

28a. Where did you obtain this information? Please circle the appropriate ones.

- (1) own initiative
- (2) newspapers
- (3) magazines
- (4) TV
- (5) radio
- (6) doctors
- (7) nurses
- (8) dietitians/nutritionists
- (9) friends and relatives

29. From your experience in managing your child's asthma, how would you rate the importance of each of the following; Please circle the relevant answer, as shown in the example given.

<u>Least important</u>	<u>Most important</u>
Example: Avoiding animals 1 ----- ② ----- 3 ----- 4 ----- 5 (fur/feathers)	

- | | |
|--|-----------------------------------|
| Avoiding food allergens | 1 ----- 2 ----- 3 ----- 4 ----- 5 |
| Avoiding exposure to cold environment | 1 ----- 2 ----- 3 ----- 4 ----- 5 |
| Avoiding exercise | 1 ----- 2 ----- 3 ----- 4 ----- 5 |
| Taking medication regularly | 1 ----- 2 ----- 3 ----- 4 ----- 5 |
| Avoiding environment allergens (e.g dust, fur) | 1 ----- 2 ----- 3 ----- 4 ----- 5 |
| Others, please give details | 1 ----- 2 ----- 3 ----- 4 ----- 5 |

—

SECTION E:

- 30. Was your child ever breast-fed?
 - (1) Yes, for how long? ____ months
 - (2) No

- 31. At what age was your child first given cow's milk?
____ months

- 32. At what age was weaning food first introduced?
____ months

- 33. Are there other family members having or had asthma?
 - (3) No
 - (1) Yes
 - if yes, (1) child's siblings and/or parents
 - (2) child's grandparents, uncles, aunts, cousins

THANK YOU!

-- End of Questionnaire --