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Sport and Nursing Aspect for Improvement Pediatric Asthma- Empirical Discussion from Literatures

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ABSTRACT
Exercise can be both a trigger for asthma and an effective way to improve symptoms. The key lies in proper control and choosing the right type of exercise. The Exercise-Induced Asthma which is the symptoms such as coughing, chest tightness, and wheezing; occurs 10 to 15 minutes after strenuous exercise. It is a serious problem that can be fatal if left untreated. Frequently asthma for child athletes, this may result in them being expelled from training. Thus this is the reason we start the research. This research was guided and conducted by a literature review. In our best knowledge, the study built goal programming math model to describe found. Before this study, we found a lot of scattered research data. However, US medical guild line would be brief discussing these non-drug controlling variables. Sport and nursing aspect for improvement pediatric asthma controllable variable in this study were described. In future study, we recommend discussing the variations at representative indicators of asthma based on different diets and exercise approaches.

KEYWORDS: *Children asthma, empirical study, goal programming, sport and nursing aspect.*

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I. INTRODUCTION

Exercise can be both a trigger for asthma and an effective way to improve symptoms. The key lies in proper control and choosing the right type of exercise. The Exercise-Induced Asthma, EIA, which is the symptoms such as coughing, chest tightness, and wheezing; occurs 10 to 15 minutes after strenuous exercise. Thus EIA is a serious problem that can be fatal if left untreated. The triggers may include: inhalation of cold air, drying out the airways due to rapid breathing, air pollution or exposure to allergens. The symptoms usually resolve within 30–60 minutes by taking a rest. If there is no external intervention such as medication, rest, exercise, etc., the result of inactivity is calling the long-term asthma occurrence. Frequently asthma for child athletes, this may result in them being expelled from training. San and Altay [1] said that 'While Everyone Else was Doing Sports, I Used to Sit on the Sidelines.' However, Delvert et al. [2] stated that low motor competence and physical activity would affect long-term health risks in children. Thus this is the reason we start the research.

II. LITERATURE REVIEW

Nowadays, there were 101,507 above of asthma in title of academic papers within PubMed database. In this section, it would discuss cause of children asthma in time serious.

In early time, Lin and Wang [3] said that asthma is a complex syndrome. For many people, asthma took root in infancy. Both genetic and environmental factors affect asthma. With the evolution of modern lifestyles and industrial development, the prevalence of asthma has also increased, including allergens, climate,

genetics, gender, age, air pollutants, viral infections, and humid environments. Hsu et al. [4] stated a 10-yr-old children due to repeated acute asthma attacks, breathing difficulties, wheezing, nighttime coughing, and insomnia, the children visited the emergency room many times, disrupting his daily work and affecting his school studies. The prevalence of asthma among first-grade in elementary students in Taipei City was approximately 20.34%. Asthma is a chronic, recurrent inflammation of the bronchi, which can cause symptoms such as difficulty breathing, wheezing, chest tightness and pain, especially in the early morning. Hsiao [5] stated that the risk factors of asthma include exposure to allergens, obesity, smoke, and environment. Higher IgE with more allergic response, the frequency of wheeze, healthcare utilization, higher BMI, work environment. Work symptoms were directly or indirectly associated with asthma control and quality of life. Kuo [6] said that asthma is a chronic inflammatory airway disease, characterized by increased expression of multiple inflammatory genes. Although immune cells play an important role in the pathophysiology of asthma, the relevant regulatory factors and regulatory mechanisms are still not clearly understood.

Wang and Wu [7] stated that asthma is a common chronic allergic disease in children. Acute attacks can be life-threatening. Only 2.5% of children with asthma achieve complete control, while the majority remain uncontrolled or partially controlled. They also experience limitations imposed by their illness, such as prohibitions on pets, dietary restrictions, or prohibitions on strenuous exercise. A ten years old boy, heigh was 145 cm, weight was 50 kg; in 2011, a cough and respiratory infection triggered pneumonia and wheezing. Initially diagnosed with asthma, the primary allergen was dust and mites. In this case, food, sleep, school activities were the trigger factors of the asthma. Praena-Crespo et al. [8] assessed whether the asthma related to sport and health. There were 2293 students (203 asthmatic) in the intervention school group and 2214 in the comparison school (224 asthmatic), which both belonged to primary school children. They found intervention group improved certain quality of life, emotional function and limitation of activities, but it failed to reduce school absenteeism. Romberg et al. [9] compared elite swimmers (n = 101), tennis players (n = 86), and a reference group (n = 1,628), observing asthma symptoms. The female occurrence rate was higher than male. Women in all sub groups reported more psychosomatic symptoms than their corresponding men; and men in the reference group reported higher self-esteem than women in the reference group.

Zhang et al. [10] conducted a cross-sectional study. They pointed out physical activity (PA) may be associated with asthma. There were 30 children with 3~5 yr-old in their study. No positive association was found between BMI and asthma. But with overweight or obesity (p=0.044) was found association with asthma. Molnár et al. [11] stated that having food containing additives and margarine were significantly higher asthma occurrence than without having. Sapartini et al. [12] proposed that vitamin D deficiency increases risk of asthma. Ren et al. [13] stated among personal factors, allergic rhinitis history, eczema history, food allergy history, and antibiotic were significantly associated with asthma (aOR = 1.89, 95% CI 1.52-2.34; aOR = 1.34, 95% CI 1.09-1.64; aOR = 1.68, 95% CI 1.37-2.06; aOR = 1.53, 95% CI 1.25-1.87, respectively). We should try to reduce these risk factors. Among environmental factors, moisture or mold in the home, infrequent house cleaning, and flooring materials were all risk factors. Podlecka et al. [14] stated that trace elements and vitamins are thought to have immunomodulatory effects. The risk of asthma is significantly associated with copper and zinc levels. Copper levels were also closely linked to allergic rhinitis and were considered an important predictor of food allergies. Copper and zinc levels, as well as overall malnutrition, would affect the immune system. They observed 80 children in Polish, whom were 9 to 12 years old, and made this conclusion. Crees et al. [15] stated that the prevalence of asthma in the United States was 8.3%. There was 15.7% black children suffer from asthma in US. Children's allergens and irritants include cigarette smoke, pollen, mold, pet dander, dust mites, and cockroaches, warm turning to cold air, emotional vibration, melancholy and over exercise. If the asthma symptoms continue to worsen, the patient needs to be sent to the intensive care unit (ICU).

Editorial [16] studied small borns' risk of asthma. They used directed acyclic graph (DAG) illustrating asthma. There were obesity, multiple birth, parental smoking, respiratory infections, gender, atopic eczema, postnatal steroids drug, etc. related to asthma. Rosser et al. [17] stated that exposure to air pollution can trigger asthma in children. There were 40 children recruited from U. of Pittsburgh Med Center Children's Hospital of Pittsburgh. They found ff the air quality is poor, children's outdoor activities must be limited. Liu [18] stated that weight training (p =0.0118) and heavy exercise exposure (p =0.0448) had a significant positive association between exercise and asthma. The genetic risk score and asthma was found to increase the risk of asthma. They should avoid high intensity exercise to avoid increased risk of asthma. Abdel-Aziz et al. [19] found that there were link between childhood asthma and microbes detected in throat swabs, such as *Streptococcus*, *Veillonella*, *Rothia*, and *Haemophilus*. The atopic dermatitis and grass pollen sensitization were high related to asthma. Alahmadi et al. [20] identified the prevalence or risk factors of asthma in Saudi children and adolescents in Rabigh. Although desert terrain is not as conducive to mold growth as humid environments, the sandy environment can still induce asthma. There were 349 children included into their study. The air quality to limit the progressive increase in asthma prevalence, as well as in others industrial communities. Shah et al. [21] used air purifiers to observed asthma. There was 95% confidence intervals [CI] = -0.413, -0.082). A sub-group

analysis for air purifier as an IPMs in developing counties reduced fractional exhaled nitric oxide by -0.208 ppb (95% confidence intervals [CI] = -0.394, -0.022). The evidence described air purifier lower down the pollutant. Shahkar et al. [22] stated that there was an association between risk factors, including active or passive smoking, underlying infections, pulmonary cysts, air pollution, genetic mutation. Clinical presentations included persistent cough, recurrent pulmonary infections, chest pain, wheezing, hemoptysis, metastatic disease symptoms, or asymptomatic in some cases.

Ora et al. [23] exercise-induced bronchoconstriction (EIB) is a common issue among athletes, its about 20% to 70% across specific sports. but paradoxically, sport can also improve pulmonary function. Airway dehydration and cooling are key mechanisms, leading to EIB. Feleszko et al. [24] took a study that from infants to children under six years old, it was found that there is a correlation between residential greening and childhood asthma. The study used a small radius (100 meters) and a large radius (500 meters) around the house as the measurement range. Rivera et al. [25] said that historically asthma management has centered on controlling symptoms in patients as its highest mission. Remission does not mean cure or control. Control means a decrease in the severity or frequency of symptoms, while remission means the disease is completely under control, but relapses are possible. Nowadays, medical treats asthma tending to control rather than cure. Malewska-Kaczmarek et al. [26] exercise was reported to occur more frequently than in nonathletes. The study was conducted among a group of 101 adolescent athletes, and found that exercise-induced bronchoconstriction (EIB) in athlete was higher occurrence than control group. Lawson et al. [27] studied that asthma related to mental health condition. Asthma was linked to major depression in Canadian children. They used Canadian Health Survey of Children in 2019, age range was 3-17 years old, sample size was 47,871, a cross-sectional, nationally Statistics.

Huang et al. [28] stated that asthma is characterized by persistent inflammation, reversible airway obstruction, and increased bronchial responsiveness. These symptoms would cause wheezing, coughing, chest tightness, and shortness of breath. Khan et al. [29] said that asthma was closely related to pollen, and it can cause frequent sneezing, itchy and watery nose, eyes, mouth, and throat. This allergy symptom was caused by sneezing, which helps protect the body and expel potential carcinogens that may cause harm. Guo et al. [30] Allergies were caused by the hypersensitivity reaction of the immune system to normally harmless substances in the environment, including food allergies, allergic asthma, and anaphylactic shock, etc. Geographic region, method of allergy assessment, age, smoking status, alcohol consumption, and gender may influence the asthma condition. Wyszynska et al. [31] said that juvenile idiopathic arthritis, congenital osteoarticular and musculoskeletal defects, haemophilia, asthma, cystic fibrosis, diabetes, sickle cell trait, hypertension, nephrotic syndrome, inflammatory bowel disease, epilepsy, a history of severe allergic reactions and reduced nephron number for the children should plan special sport approaches for them. Papamichael and Katsardis [32] said that evidence based showed that complaints of breathlessness, stridor and noisy breathing on inhalation during strenuous exercise are common in youth athletes, and they are often been classified into exercise-induced asthma category. He et al. [33] studied children and young adults in a Swedish. There were 4089 person been observed. From urine collection, pollutants, with diameter ≤10μm (PM_{10}), ≤2.5 μm ($PM_{2.5}$), and nitrogen oxides (NO_x) were analyzed. They found a link between air pollution and asthma. González et al. [34] stated that PM2.5 exposure and its association with asthma in human airway epithelial cells. It altered expression patterns and processes between PM2.5 exposure and asthma. Nascimento et al. [35] stated that temperature, relative humidity, and pollutant related to children asthma. Zha et al. [36] included 673 children, average age was 7.3 ~14 yr-old, and 13 randomized controlled trials. They used forced expiratory volume in 1 s percentage (FEV1%) as indicator. For children with asthma, exercise training may improve their motor skills and quality of life, but it cannot reduce the degree of inflammation. Gudziunaite et al. [37] reviewed 12161 papers and found children were more susceptible to air pollution due to their less-developed respiratory systems and higher respiratory rates. It pointed a serious problem that if children exercise in polluted air environment, it would harm them rather than without exercise. Majkowska-Wojciechowska et al. [38] studied children and adult IgE and allergen. There were 1171 patients in their study from the central Poland urban area during 2017 to 2020. The highest reactivity frequencies were found for grass (60.5%), rye (57.22%), birch (47.34%), alder (42.5%) and *Dermatophagoides pteronyssinus* mites (41.8%). Different people produced different amounts of IgE derivatives in response to allergens. Individuals with prior experience of allergy to that antigen would experience a stronger reaction upon re-exposure to the allergen.

Based on above literatures, each paper expressed their found; however, we did not know what should be noticed in overall in sport or nursing aspect for improvement pediatric asthma.

III. PROBLEM FORMULATION

Medical doctors were not easily known the relationship among risk factors. But in our best knowledge known that we should try to lower down the value of risk factor g_i.

g_i : a normalized risk factor at children asthma. A zero to one value, it would compare this movement to previous one. If the g_i turns up, it would not count getting better and not to classify to formula (1); thus only g_i turns down would be counted.

risk factor g_i would be cold air, rapid breathing, virus, dust, mites, air pollution, air allergens, food allergens, IgE derivatives, bad mood, without enough sleep, without suitable or over exercise, without enough vit. D and without drugs.

This research adapted goal programming. It would illustrate as follows:

$$\textbf{min } f(g_1, g_2, ..., g_n) \quad (1)$$

s.t.

$$0 \le g_i \le 1 \qquad \forall \qquad i \quad (2)$$

Until now, we did not understand the relationship among sub goals. But we know that we has to lower down the children asthma risk factor value. In the bellow figure 1, it stated we how to process empirical discussing engineering. This study only discussed the controllable variable, which related to sport or nursing aspect . The aging, DNA, etc. would not want to be discussed. Majkowska-Wojciechowska [38] stated IgE derivatives would based on individuals with prior experience of allergy. Thus, the less IgE derivatives, the better is.

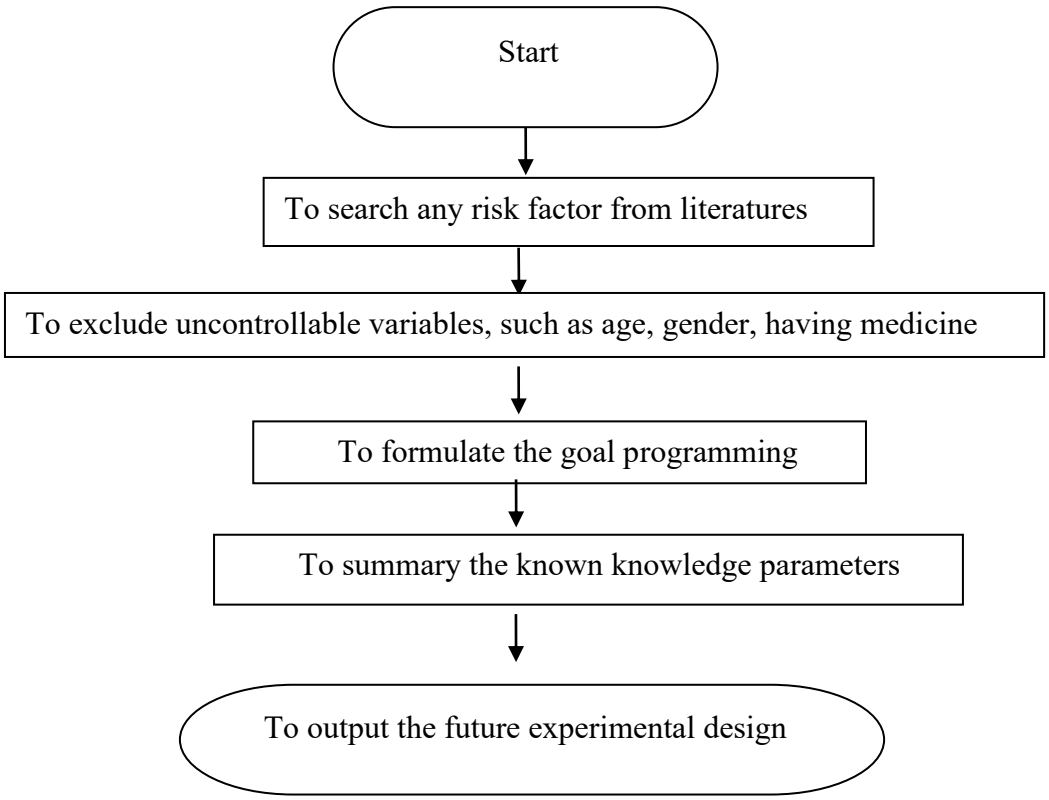

Figure 1 The Empirical Discussing Engineering

IV. RESEARCH RESULTS

In table 1, we summarized the literature results and listed the risk factors for pediatric asthma in Table 1 in the form of comparative weights. The researches were the main part of pressed data from ISAAC organization. Without global questionary survey, we did not know the weights of the regression coefficient and built an equation. To avoid EIA, the requirement of children's rehabilitation exercises was shown in table 2. In

the literature, frequent period is less than5 times in a week, keep heart rate below 70% of maximum one, warm up for exercise at least 10 minutes, avoiding sudden stops in movement, and remember safety boundary in different sport, such as shown in table 2.

Within literatures, there were many parameters we did not know, such as sport strength and period, how to have our food, how to avoid those allergens, etc. It's a long way has to do in academic research field.

Table 1 Risk for Asthma from Literature

Parameter type	Weight
Region	high income region > lower one
Age	6~7 yr-old greater than 13~14 yr-old
Gender	boy > girl
City Status	city > urbanicity
Climate	cold air > warm air
Air quality	PM2.5 > without

Calculate from ISAAC, https://isaac-online.org/

Table 2 Safety Boundary for Asthma Children Exercise

Sport type	exercise time
Bicycle	lower than 20 mins
Jog	lower than 30 mins
Swin	lower than 40 mins

Rewrote and cited from https://rehabinfoguide.com/

V. CONCLUSION

To summary the literatures, there were a lot of parameters did not find. For example, sport strength and period, how to have our food, how to avoid those allergens, etc.; even how to large laugh to avoid inducing asthma. Before this study, we found a lot of scattered research data. However, US medical guild line would be brief discussing these non-drug controlling variables. In future study, we recommend discussing the rise in representative indicators of asthma based on different diets and exercise methods, and obtaining IRB approval before implementation.

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The work is pure literature review and building math model. The entire article used secondary, published materials and does not involve unpublished human records. Also thanks for cited literatures.

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