

# Immigrant Syndrome

HaiYing Shen<sup>1,2</sup> BeiYuan Shen<sup>3</sup>

**【 Abstract 】** Immigrant syndrome (or traveler syndrome) is a series of syndromes and disorders of the human body in response to the natural environmental changes when the immigrants or travelers migrate from their native homeland to another region. Based on the idea of improving the health status of immigrant groups and achieving the comprehensive healthcare of immigrants, this work for the first time reports the cause, disorders, epidemiology, management, prevention and healthcare of immigrant syndrome.

**【 Key words 】** immigrant syndrome; traveler syndrome; immigrant health

Immigrant syndrome (or traveler syndrome), also known as Shen immigrant syndrome, is a series of syndromes and disorders of the human body in response to the natural environmental changes that occur when immigrants or travelers migrate from their native homeland to another geographical region. The natural geographical factors and residential environmental factors will have direct and indirect effects on the human body<sup>[1-5]</sup>. It was first described by Dr. HaiYing Shen in accordance with the medical experiences at the international medical center.

In order for human beings to survive, they need to adapt to their new environment. The ability of the human body to adapt to natural environments comes from both innate and acquired factors<sup>[1,6]</sup>. The innate adaptation is a result of evolution. The Andean Mountains and Tibet Plateau where are high-altitude areas with less oxygen and low atmospheric pressure have evolved the physiological activity and structure of thorax of the natives there to become stronger than those of the residents in the plain areas<sup>[1,6-8]</sup>. The Inuit

living in the Arctic Circle, despite living in the low temperatures, can sleep in the open air with ease<sup>[4]</sup>.

The acquired adaptation is developed in response to the specific natural environmental factors. When the factors of natural geographical environments are changed, the stimuli of changes are reflected to the hypothalamus through receptors, and the hypothalamus dominates the pituitary gland to regulate the endocrine function in order to maintain the balance within the body before and after the changes<sup>[3,9]</sup>. Depending on the individual, the time needed to adapt will vary. The variance of the time course is generally related to the individual physiological and health conditions. People in a healthy state generally exhibit higher adaptability than weaker individuals and are thus more competent to withstand the changes of new geographical environments<sup>[10]</sup>.

## 1 Cause

1.1 Air, air quality. When people originally lived in a good air environment move into the contaminated air environments containing smog, dust, haze and the like, such irritants will soon induce discomfort of the upper respiratory tract<sup>[11]</sup>.

1.2 Water, the difference in pH and hardness of drinking water.

DOI:

Author affiliations: <sup>1</sup> Seoul National University Hospital, Seoul, Korea 03080; <sup>2</sup> Vista-SK International Medical Center, Shenzhen, China 518061; <sup>3</sup> Korea University Graduate School of Life Sciences and Biotechnology, Seoul, Korea 02841

Corresponding author: HaiYing Shen. E-mail:shenhynd@163.com

1.3 Soil, the difference in pH, minerals and trace elements, as well as the organic matters contained in soil.

1.4 Climate and meteorological factors, the difference in temperature, sunlight, and relative humidity.

1.5 Atmospheric pressure. The altitude-related altitude sickness is the negative health effect of high altitude caused by exposure to low amounts of oxygen at high elevation, with the symptoms that may include headaches, nausea, dizziness, fatigue, and sleep disturbance<sup>[2,5,12-14]</sup>.

1.6 Minerals and trace elements. Minerals and trace elements are contained in water and soil and so contained in food. The component and content of minerals and trace elements are regionally variant. For instance, iodine is a dietary mineral and micronutrient which is abundant in the food supply in coastal regions but is rare further inland.

1.7 Biological factors. The environmental biological factors such as bacteria, fungi, dust mites, mosquito bites, ticks or other insects in environments can be allergic factors.

1.8 Food factors, involving the food factors due to drinking water and soil factors, and the difference in food nutrients (e.g., polysaccharides, proteins, lipids and vitamins), and the difference in cooking and dietary habits. These factors can disturb the original homeostasis of the intestinal environment and are associated with nutritional and metabolic diseases<sup>[15]</sup>. They cause the loss of gut microbiome diversity and function, and reduce the beneficial intestinal bacteria to a great degree<sup>[15]</sup>. The digestive enzymes in the body can fully exert digestive functions on native foods but often fail on allopatric foods.

1.9 Mental factors. Homesickness and the unfamiliar social environment may psychologically induce stress, anxiety and depression<sup>[16]</sup>.

1.10 Other specific factors. The difference between iodized salt areas and non-iodized salt areas<sup>[17]</sup>. Chemically contaminated areas, such as the pollution of hormone-disrupting chemicals<sup>[9,18]</sup>.

## 2 Symptoms and disorders

### 2.1 Respiratory disorders

Respiratory tract infections, including upper respiratory tract infections and lower respiratory tract infections (e.g., pneumonia, more in the aged), bronchitis, asthma (more in children and juveniles), and other acute and chronic respiratory diseases are the common exhibited respiratory diseases.

### 2.2 Gastrointestinal disorders

The most common gastrointestinal disorder is acute gastroenteritis, with the symptoms of vomiting, diarrhea and abdominal pain. Other disorders are loss of appetite, chronic diarrhea, constipation, chronic peptic ulcer, and gastrointestinal dysfunction including gastric dysfunction and irritable bowel syndrome. Intestinal flora imbalance can cause intestinal dysfunction.

### 2.3 Dermatoses

The common skin diseases are eczema, dermatitis, acne and ringworm.

### 2.4 Otorhinolaryngology

The common ENT diseases are tonsillitis, pharyngitis and laryngitis, rhinitis, sinusitis and otitis media. These diseases are also considered upper respiratory tract infections.

### 2.5 Ophthalmology

The common diseases are conjunctivitis, dry eye syndrome, retinopathy (due to the disorder of nutrients and trace elements), and vision changes and fatigue.

### 2.6 Allergic diseases

Allergic skin diseases, allergic conjunctivitis, allergic rhinitis, allergic asthma, and anaphylactoid purpura are the common diseases. The allergens can exist in polluted air, in environmental biological factors such as dust mites, or in food factors.

### 2.7 Urinogenital system diseases

The common diseases are acute or chronic urinary tract infections. In women, the infections and other disorders in reproductive system such as vaginitis or pelvic inflammatory disease may also occur<sup>[19]</sup>. Contaminated air, humid climate, or environmental biological factors may induce infection.

### 2.8 Endocrine disorders

The environmental factors, nutritional factors and emotional factors, such as contaminated air, iodine intake, or psychological stress, all can be the cause of endocrine disorders. For instance, the toxic gases in contaminated air can cause endocrine dyscrasia indirectly after entering the human body. Jet lag or climate change can disrupt menstrual cycles and induce irregular menstruation. The stimuli of these factors are reflected to the hypothalamus which dominates the pituitary gland to regulate endocrine function. The hypothalamus controls secretion of pituitary gland hormones, which can be classified as the branches hypothalamic–pituitary axis (HP axis) of adrenal (HPA), gonadal (HPG), thyroid (HPT), somatotrophic (HPS), and prolactin (HPP) axes.

The abnormal secretion of hypothalamic–pituitary hormones causes disorder of adrenal glands, islets, gonads, thyroid, etc<sup>[3]</sup>. The disorder of sexual hormones may induce menstrual disorder, the reproductive system diseases such as hysteromyoma or oophoritic cyst, and breast diseases such as mammary gland hyperplasia and nodule in female; and induce sexual dysfunction in male and gynecomastia in pubertal male. In adults and elderly, the abnormal secretion of adrenal cortex can induce and aggravate hypertension, diabetes and gout.

Thyroid diseases can be induced due to changes of dietary iodine. Iodine is the essential element for the synthesis of thyroid hormones. Thyroid hormones influence metabolism, growth and development of body<sup>[20,21]</sup>. The most common effects of high iodine on thyroid function are iodine-induced goiter, hyperthyroidism and thyroid nodules. Iodine deficiency induces hypothyroidism with the abnormality such as goiter, cretinism, or fibrocystic breast changes. Environmental and emotional factors can also be responsible for the induction of thyroid diseases. Thyroid diseases are more common in women.

## 2.9 Nutritional (vitamins and trace elements) and metabolic disorders

Vitamins have diverse biochemical functions that they participate in metabolism of cell and tissue, functioning as

coenzymes or as regulators of mineral metabolism. The deficiency of vitamins and trace elements can be induced in the conditions of lack of intake, lack of absorption due to gastrointestinal disorders, and abnormalities in synthesis and metabolism due to endocrine disorders<sup>[22-29]</sup>.

Vitamin D deficiency will cause rickets (children), skeletal malformations such as scoliosis in teenagers, osteomalacia (adults, pregnant and lactating women) or osteoporosis (the aged), and will increase the risk of other diseases such as autoimmune diseases (e.g., asthma)<sup>[22-29]</sup>.

## 2.10 Cardiovascular diseases

The common diseases are hypertension and arrhythmias in the aged<sup>[25]</sup>. Sinus tachycardia and atrial premature beat also occur in adolescent and women. Endocrine disorders of adrenal gland and thyroid, nutritional and metabolic disorders, and psychosocial factors can contribute to the attack of hypertension and arrhythmias.

## 2.11 Motor system diseases

Endocrine and metabolic disorders and nutrient deficiency (vitamins and trace elements) contribute to the diseases of skeletons, joints, and muscles (including tendons and other soft tissues). The acute traumas such as fracture, dislocation or soft tissue injury (sprain) most commonly occur in male youth. The chronic strain (e.g., lumbar muscle strain), degenerative changes at cervical and lumbar vertebra and knee-joint, and arthritis (e.g., osteoarthritis, rheumatoid arthritis, or gout) occur in adults and elders.

## 2.12 Mental and neuropsychological disorders

The unfamiliar social environment psychologically contributes to the induction of mental disorders, and the nutritional and metabolic disorders physically play the role that promotes the induction. The common disorders are stress, anxiety and depression, insomnia, and cephalalgia (e.g. migraine)<sup>[16]</sup>.

## 2.13 Somatic symptom disorders

Nutritional and metabolic disorders contribute to somatic symptom disorder that have no physical causes but have symptoms such as palpitations, chest congestion, inappetence, sleep disorders, fatigue, and (, and emaciation.)

emaciation.

### 3 Epidemiology: infants, juveniles, women, men and elders

#### 3.1 Infants

The common diseases of infants are skin diseases such as eczema, upper respiratory tract infections, asthma, diarrhea, constipation and rickets<sup>[18,22,23,30]</sup>.

#### 3.2 Juveniles in puberty

The common diseases of juveniles are allergic disease, retinopathy, vision changes and fatigue, rickets and scoliosis<sup>[22]</sup>.

#### 3.3 Women

The common diseases of women are menstrual disorder, breast diseases of breast hyperplasia, nodules and cysts, acute and chronic inflammation and abnormally proliferative diseases of reproductive system (such as uterine fibroids and ovarian cysts), thyroid diseases, and somatic symptom disorder<sup>[19,29]</sup>.

Pregnant and lactating women. The common diseases are osteomalacia caused by vitamin D deficiency and anemia caused by deficiency of iron and folic acid<sup>[24,28,29]</sup>.

#### 3.4 Men

The common diseases of men are skin diseases, acute and chronic motor system diseases, depression and migraine, fatigue and sexual dysfunction.

#### 3.5 Elders

The common diseases of elders are respiratory tract infections, digestive disorder, soft tissue strain, arthritis, degenerative osteoarthritis, osteoporosis, hypertension, and somatic symptom disorder<sup>[25]</sup>.

### 4 Management

Regular checkups at medical institutions and immediate consultations with doctors as soon as symptoms exhibit in order to get treatment in time are necessary. In regard to the principle of management, in addition to basic symptomatic treatments, the endocrine and nutritional metabolic disorders should be given sufficient attention. And the

stable improvement of function is necessary so as to adjust digestive enzymes and intestinal flora on digestive disorder cases<sup>[15]</sup>.

### 5 Prevention

People in healthy state have a stronger adaptability and are more likely to withstand environmental changes. Enhance physical fitness, participate in sports with regular rests, in addition to adequate nutritional supplements are beneficial towards attaining the best possible level of adaptability.

Warm tip: Because of the difference of iodine intake between iodized salt areas and non-iodized salt areas, bringing local salt will to some extent help with adaptation.

### 6 Healthcare: infants, juveniles, women, men and elders

#### 6.1 Infants' healthcare

The sufficient nutritional supplements for infants can efficiently depress the morbidity of skin diseases, respiratory tract infections and allergic disease, and can prevent rickets. After correcting diarrhea and constipation, one also needs probiotics to improve digestion and absorption.

Warm tip: Bring infants for vaccination on schedule and ensuring adequate nutritional supplements are requisite for healthy kids. The principal attention of immigrant parents is to consult with the relevant institutions and insure the process of vaccination, checkup and nutritional supplement for kids.

#### 6.2 Juveniles' healthcare

Have adequate outdoor sports and get sufficient nutritional supplements to enhance physical fitness will help to prevent the attack of allergic disease, rickets and scoliosis and help to protect vision and skeletal growth.

Warm tip: Juveniles are continuously developing as they get older, so slight abnormalities are prone to be unnoticed or neglected by the young individual. Therefore, parents need to pay careful attention to changes and deficiencies. As the child develops, the physical needs change and sufficient

nutrients are required by juveniles entering puberty. Checkups and the supplement of nutrients (vitamins and trace elements) are also necessary.

The mental state of juveniles is very sensitive to change, so such large changes in their environment from familiar to unfamiliar will likely upset their mental and emotional state. This requires parents and teachers to give them beneficial direction and encouragement.

### 6.3 Women's healthcare

Regular checkup on breast and reproductive systems are necessary for women. Checkup on thyroid function is also necessary for women especially those migrate between iodized salt areas and non-iodized salt areas. Upon irregular menstruation, the disorder of hypothalamic–pituitary–gonadal axis induced by nutritional deficiencies should also be considered. Due to the consumption during menstrual periods and the extra demands of pregnancy and the lactation period, women need efficient and long-term supplements of vitamins, minerals and trace elements<sup>[26]</sup>.

Warm tip: The troubles on health will psychologically give women stress and anxiety, especially as they come to an unfamiliar social environment. This increases the need for early checkups and treatments to maintain or recover a healthy mind and body. Moreover, they are psychologically expected to visit doctor accompanied with their sex partners, and the psychological comforts from partners are also required to relieve their psychological stress. “Partners-expectation” is termed by Dr. HaiYing Shen to describe the women's psychological expectation of the companion and comfort from their sex partners as they encounter disease.

### 6.4 Men's healthcare

The sufficient dietary nutritional supplements and adequate fitness training will help men to prevent motor system diseases. The higher working pressure can affect hypothalamic-pituitary hormone secretion, so the moderate entertainment and leisure sports which play the role that release stress and relieve fatigue are good for men's healthy mental state and sexual function.

Warm tip: The men's healthcare is commonly ignored

compared to the more attentions on the healthcare of kids, women and the elder. But in fact, because of the physiologically higher metabolic level of men, the heavy work and family responsibility of men, and the high self-discipline of men which gives them the mental state of high tone, the more sufficient nutritional supplements are required to maintain the metabolic balance and the energetic metabolic level of men. The deficiency on vitamins, minerals and trace elements are also commonly found in adult males, but not merely in kids and women.

As men encounter discomfort, men commonly endure in silence because of the man's willpower, and delay seeking help till they ultimately fail to overcome them. This can cause disorders to progress sometimes even to extreme levels, and the postponed treatment may be late or lacking in effectiveness due to progression of the disease. “Men healthcare— do not ignore” is advised by Dr. HaiYing Shen to remind people that men's healthcare should be given full attention and not ignored. Adult males also require the health checkup and administration in time.

### 6.5 Elders' healthcare

The acute respiratory tract infections especially lower respiratory tract infections and the acute gastrointestinal disorders should be paid close attention, and effective treatment should be given as soon as possible. In regard to chronic diseases and senile diseases, long-period and stable symptomatic treatments are necessary, and the adjuvant therapy of nutritional supplements and immunity enhancement are also required to improve fitness quality.

Warm tip: The elders have accustomed to the life on homeland, and even though they try to do self-adjustment, their adaptability and immunity of body are not as strong as the youth due to age. So, early and effective treatment is requisite for elders. And as their health encounters problems, they dislike loneliness but long for company and care of family to get psychological comfort.

## 7 Initiatives: attention on immigrant healthcare and humanitarian care

Health is an important aspect of the quality of immigrant life. Appeal to governments, organizations and communities, as well as charities, to give more concern and support on checkup and treatment of immigrants<sup>[19,25,27]</sup>. And dedicate humanitarian compassion, consolation, respect, and care to children, adolescents, and the frail and elder. It is also advocated that medical insurers can improve the insurance that covers the healthcare of immigrant syndrome, involving nutritional and metabolic treatments.

## References

- [1] Moore LG, Niermeyer S, Zamudio S. Human adaptation to high altitude: regional and life-cycle perspectives [J]. *Am J Phys Anthropol*, 1998, 27: 25-64.
- [2] Rodway GW, Hoffman LA, Sanders MH. High-altitude-related disorders--Part I: Pathophysiology, differential diagnosis, and treatment [J]. *Heart Lung*, 2003, 32(6): 353-359.
- [3] Fliers E, Boelen A, van Trotsenburg AS. Central regulation of the hypothalamo-pituitary-thyroid (HPT) axis: focus on clinical aspects [J]. *Handb Clin Neurol*, 2014, 124: 127-138.
- [4] Fumagalli M, Moltke I, Grarup N, et al. Greenlandic Inuit show genetic signatures of diet and climate adaptation [J]. *Science*, 2015, 349(6254): 1343-1347.
- [5] Hartman-Ksycińska A, Kluz-Zawadzka J, Lewandowski B. High altitude illness [J]. *Przegl Epidemiol*, 2016, 70(3): 490-499.
- [6] Xing G, Qualls C, Huicho L, et al. Adaptation and mal-adaptation to ambient hypoxia; Andean, Ethiopian and Himalayan patterns [J]. *PLoS One*, 2008, 3(6): e2342.
- [7] Gilbert DL. The first documented description of mountain sickness: the Andean or Pariacaca story [J]. *Respir Physiol*, 1983, 52(3): 327-347.
- [8] Chen QH, Ge RL, Wang XZ, et al. Exercise performance of Tibetan and Han adolescents at altitudes of 3,417 and 4,300 m [J]. *J Appl Physiol*, 1997, 83(2): 661-667.
- [9] Decherf S, Seugnet I, Fini JB, et al. Disruption of thyroid hormone-dependent hypothalamic set-points by environmental contaminants [J]. *Mol Cell Endocrinol*, 2010, 323(2): 172-182.
- [10] Fiore DC, Hall S, Shoja P. Altitude illness: risk factors, prevention, presentation, and treatment [J]. *Am Fam Physician*, 2010, 82(9): 1103-1110.
- [11] Nielsen GD, Wolkoff P. Evaluation of airborne sensory irritants for setting exposure limits or guidelines: A systematic approach [J]. *Regul Toxicol Pharmacol*, 2017, 90: 308-317.
- [12] Berghold F. Diagnosis and therapy of acute altitude sickness [J]. *Wien Med Wochenschr*, 2000, 150(8-9): 169-174.
- [13] Carod-Artal FJ. High-altitude headache and acute mountain sickness [J]. *Neurologia*, 2014, 29(9): 533-540.
- [14] Luks AM, Swenson ER, Bärtsch P. Acute high-altitude sickness [J]. *Eur Respir Rev*, 2017, 26(143): 160096.
- [15] Vangay P, Johnson AJ, Ward TL, et al. US Immigration Westernizes the Human Gut Microbiome [J]. *Cell*, 2018, 175(4): 962-972.
- [16] Bianucci R, Charlier P, Perciaccante A, et al. The "Ulysses syndrome": An eponym identifies a psychosomatic disorder in modern migrants [J]. *Eur J Intern Med*, 2017, 41: 30-32.
- [17] Magri F, Zerbini F, Gaiti M, et al. Poverty and immigration as a barrier to iodine intake and maternal adherence to iodine supplementation [J]. *J Endocrinol Invest*, 2018, 42(4): 435-442.
- [18] Jung EM, Kim EM, Kang M, et al. Children's Environmental Health Indicators for Low- and Middle-Income Countries in Asia [J]. *Ann Glob Health*, 2017, 83(3-4): 530-540.
- [19] Bacal V, Blinder H, Momoli F, et al. Is Immigrant Status Associated With Cervical Cancer Screening Among Women in Canada? Results From a Cross-Sectional Study [J]. *J Obstet Gynaecol Can*, 2018.
- [20] McAninch EA, Bianco AC. Thyroid hormone signaling in energy homeostasis and energy metabolism [J]. *Ann N Y Acad Sci*, 2014, 1311(1): 77-87.
- [21] Kouidhi S, Clerget-Froidevaux MS. Integrating Thyroid Hormone Signaling in Hypothalamic Control of Metabolism: Crosstalk Between Nuclear Receptors [J]. *Int J Mol Sci*, 2018, 19(7).
- [22] Thacher TD, Pludowski P, Shaw NJ, et al. Nutritional rickets in immigrant and refugee children [J]. *Public Health Rev*, 2016, 37(1): 3.
- [23] Madar AA, Gundersen TE, Haug AM, et al. Vitamin D supplementation and vitamin D status in children of immigrant background in Norway [J]. *Public Health Nutr*, 2017, 20(16): 2887-2892.
- [24] Dahlman I, Gerdhem P, Bergström I. Vitamin D status and bone health in immigrant versus Swedish women during pregnancy and the postpartum period [J]. *J Musculoskelet Neuronal Interact*, 2013, 13(4): 464-469.
- [25] Ruwanpathirana T, Reid CM, Owen AJ, et al. Assessment of vitamin D and its association with cardiovascular disease risk factors in an adult migrant population: an audit of patient records at a Community Health Centre in Kensington, Melbourne, Australia [J]. *BMC Cardiovasc Disord*, 2014, 14: 157.
- [26] Granlund L, Ramnemark A, Andersson C, et al. Prevalence of vitamin D deficiency and its association with nutrition, travelling and clothing habits in an immigrant population in Northern Sweden [J]. *Eur J Clin Nutr*, 2016, 70(3): 373-379.
- [27] Högler W, Munns CF. Rickets and osteomalacia: a call for action to protect immigrants and ethnic risk groups [J]. *Lancet Glob Health*, 2016, 4(4): e229-230.
- [28] Hunter-Adams J, Rother HA. Pregnant in a foreign city: A qualitative analysis of diet and nutrition for cross-border migrant women in Cape Town, South Africa [J]. *Appetite*, 2016, 103: 403-410.
- [29] Ben Natan M, Brandin Rimkus A, Tseytlin Eryomine A. Factors associated with intention of Israeli-born women and immigrant women from the Former Soviet Union to take folic acid before and during pregnancy [J]. *Int J Nurs Pract*, 2018, 24(2): e12622.
- [30] Sánchez Muro JM, Yeste Fernández D, Marín Muñoz A, et al. Plasma vitamin D levels in native and immigrant children under the age of 6 years of different ethnic origins [J]. *An Pediatr (Barc)*, 2015, 82(5): 316-324.