



Research and Application of High-efficiency Multifunctional Salt Reducing Appliances for Chronic Diseases

Xiujuan Liu*¹, Tianliang Cui², Jiannan Zhang¹

¹School of Nursing, University of Chifeng, Chifeng, Inner Mongolia, 024000

²Internal Medicine-Neurology, Chifeng Municipal Hospital & Chifeng Clinical Medical School of Inner Mongolia Medical University, Chifeng 024000, Inner Mongolia Autonomous Region, China

* Corresponding author: cfx_y_zyx1983@163.com

Abstract. Chifeng is a multi-ethnic city, and different ethnic minority areas have different special salt intake habits. The special salt intake habits in ethnic minority areas are an important factor affecting the prevalence of hypertension. In response to this problem, four salt reduction appliances have been designed based on the dietary habits of Chifeng area to forcibly reduce the salt intake of residents in Chifeng area.

Keywords: Chifeng region; Chronic diseases; Salt reducing appliances; Research and application.

1 Introduction

Nowadays, the important chronic disease threatening the health of residents is primary hypertension, which can cause various subclinical target organ damage such as vascular disease, early renal damage, left ventricular hypertrophy, and so on under the influence of various risk factors. The pathogenesis of hypertension is complex and is the result of the interaction between genetic susceptibility and living environment. Its occurrence and development are closely related to sodium intake. Currently, most people in China consume more salt than their daily physiological needs^[1-4]. High salt diet is a phenomenon that can be seen everywhere. The biggest source is the use of seasoning and soy sauce in cooking, as well as the consumption of pickled vegetables. Long-term high salt diet can also bring many adverse effects on patients with primary hypertension, such as kidney damage, kidney stones, obesity, left ventricular hypertrophy, myocardial fibrosis, and cerebrovascular diseases. Previous studies have focused on the impact of high salt diet on blood pressure, while a few have studied the damage of high salt diet to target organs in patients with hypertension. Excessive dietary sodium intake not only can increase blood pressure, but also can lead to an increased risk of cardiovascular and cerebrovascular diseases. At the same time, it may also resist the therapeutic effects of antihypertensive drugs^[5-9].

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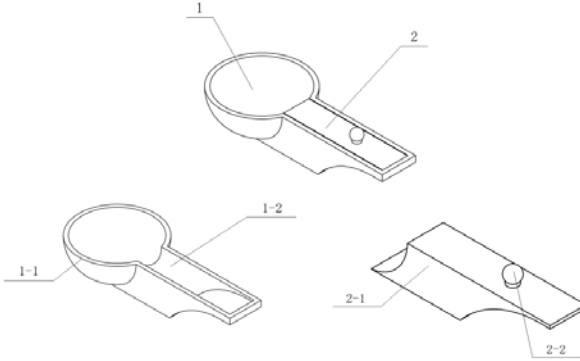
Currently, the prevalence of hypertension is the highest among chronic diseases in the elderly, and hypertension has become a common and frequently-occurring disease among the elderly. Hypertension currently has no cure and requires lifelong treatment. This not only seriously affects the quality of life of elderly patients, but also brings a heavy economic burden to patients and families due to long-term treatment costs. Currently, there are two ways to treat hypertension: medication and non medication. Non drug therapy for hypertension mainly refers to lifestyle intervention, and low salt diet, as the main method of lifestyle intervention, has the characteristics of low cost and high efficiency compared to drug therapy. Studies have shown that long-term adherence to a low salt diet can reduce systolic blood pressure by 6.7 mmHg and diastolic blood pressure by 3.5 mmHg. Studies have shown that a cost benefit analysis and comparison of low salt diet and drug treatment shows that low salt diet can reduce the incidence of cardiovascular events, myocardial infarction, and stroke in the elderly, saving tens of millions of medical expenses[10-12].

2 Design of salt control appliance

Chifeng is a multi-ethnic city, and different ethnic minority areas have different special salt intake habits. The special salt intake habits in ethnic minority areas are an important factor affecting the prevalence of hypertension. For example, the Mongolian people consume a large amount of salty milk tea per capita, nearly 2kg per day, and eat dried salted beef and mutton, with a daily salt intake of about 10-12g per capita. This special salt intake habit of ethnic groups with high salt intake is not conducive to blood pressure control in patients with hypertension. The relevant government departments have been deeply aware of the seriousness of this problem and have launched a comprehensive "salt restriction" campaign, but the results have not been satisfactory. Some simple and easy to promote salt control devices are needed to forcibly reduce people's salt intake. Therefore, according to the dietary habits of Chifeng District, four types of salt reducing appliances were designed^[13-14].

2.1 Sliding salt control spoon

The sliding salt control spoon consists of a fixed spoon, a fixed spoon body, a chute, a slider spoon, a slider spoon body, and a push pull handle, as shown in Figure 1.



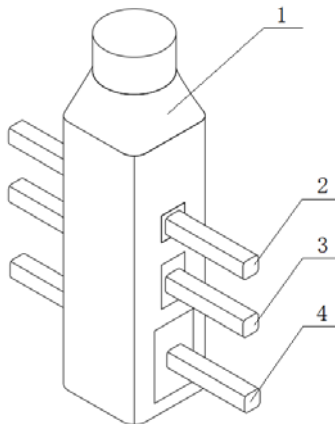
1. Fixed spoon, 1-1. Fixed spoon body, 1-2 chute, 2. Slider spoon, 2-1. Slider spoon body, 2-2. Push pull handle

Fig. 1. Structural Diagram of Sliding Salt Control Spoon

The front half of the fixed spoon is provided with a fixed spoon body; The rear half of the fixed spoon is provided with a chute; The lower half of the slider spoon is provided with a slider spoon body; The upper half of the slider spoon is provided with a push pull handle; The slider spoon body is installed in the chute.

2.2 Pulling type salt control bottle

The pull-out type salt control bottle consists of a bottle body, a toddler salt control pull-out box, a child salt control pull-out box, and an adult salt control pull-out box, as shown in Figure 2:



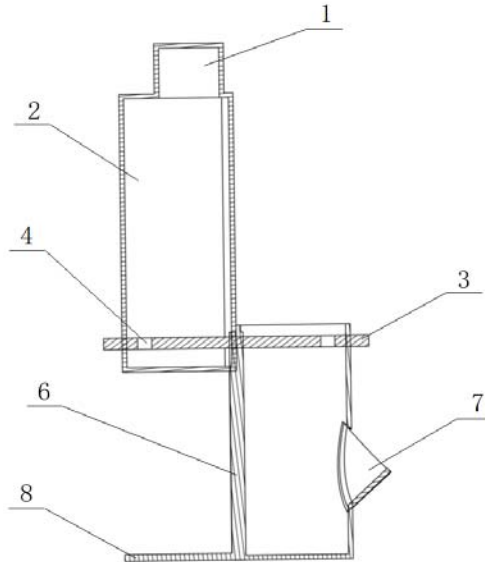
1. Bottle body, 2. Children's salt control pull box, 3. Children's salt control pull box, 4. Adult salt control pull box

Fig. 2. Structural Diagram of Pulling Type Salt Control Bottle

The middle of the bottle is equipped with a baby salt control pull box; The middle and lower parts of the bottle are installed with a children's salt control pull box; The lower part of the bottle is installed with an adult salt control pull box.

2.3 Rotary salt control cup

The rotary salt control cup is composed of a bottle cap, a salt storage bottle, a rotating disk, a salt discharge hole, a positioning groove for the salt discharge hole, a salt drop cup, a salt pouring nozzle, and an anti turnover plate, as shown in Figure 3:



1. Bottle cap, 2. Salt storage bottle, 3. Rotary disk, 4. Salt discharge hole, 5. Salt discharge hole positioning groove, 6. Salt dropping cup, 7. Salt pouring nozzle, 8. Anti turnover plate

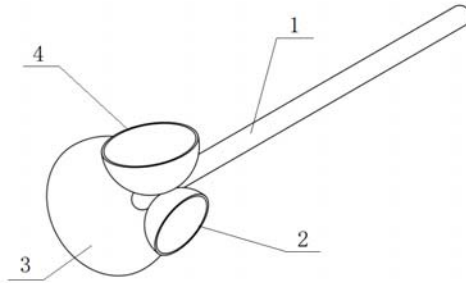
Fig. 3. Structural diagram of rotary salt control cup

A bottle cap is arranged above the salt storage bottle; A rotating disk is arranged at the bottom of the salt storage bottle; A salt discharge hole is uniformly arranged inside the rotating disk; The outer edge of the rotary disk is provided with a salt discharge hole positioning groove; A salt falling cup is installed at the lower part of the rotating disk; The middle and lower side walls of the salt dropping cup are provided with a salt pouring nozzle; Install an anti overturn plate at the bottom of the salt falling cup. The salt in the salt storage bottle is quantitatively discharged into the salt falling cup through the rotation of the rotating disk, and then added to the cooking ingredients through the salt pouring nozzle.

2.4 Three sided salt control spoon

The three-sided salt control spoon consists of a cylindrical handle, a child salt control spoon, an adult salt control spoon, and a child salt control spoon.

One end of the cylindrical spoon handle is evenly distributed to install a child salt control spoon, an adult salt control spoon, and a child salt control spoon, as shown in Figure 4:



- 1. Cylindrical spoon handle, 2. Child controlled salt spoon, 3. Adult controlled salt spoon, 4. Child controlled salt spoon

Fig. 4. Structural Diagram of Three-side Salt Control Spoon

3 Summary

Chifeng is a multi-ethnic city, and different salt control tools are designed based on the different special salt intake habits in different ethnic minority areas. In addition, it encourages traditional cooking methods such as putting salt late, eating less pickled products such as pickled vegetables, and actively selecting processed foods with less salt to reduce salt consumption. The new method of replacing edible salt with low sodium salt has a high acceptance. According to the characteristics of residents in Chifeng District, it is necessary to stimulate health awareness, standardize health knowledge, and guide health behavior. As residents in Chifeng District pay more and more attention to their own health, the demand for salt reduction is gradually increasing, and the demand for salt reduction tools is becoming increasingly diverse. Although salt reduction operations are still underway

At the next stage, we need to make joint efforts by ourselves, the government, and enterprises to promote salt reduction work through practical actions. The research and development of salt control devices and the operation of salt control methods are a long-term systematic project. In the future, the salt reduction health index will continue to be updated and improved. This study hopes to provide a more valuable reference for salt reduction work in China.

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