**IDENTIFICATION OF DRUG CHEMICAL CONTENT IN SLIMMING HERBAL MEDICINE: A CASE STUDY IN MEDAN CITY**

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**ABSTRACT**

Jamu, a traditional Indonesian herbal medicine, is composed of plant, animal, and mineral extracts, and has been used for generations. However, some slimming herbal products may contain synthetic pharmaceutical compounds, such as furosemide, sibutramine e hydrochloride, and hydrochlorothiazide, raising safety concerns. This study aimed to identify the medicinal chemicals in the slimming herbal products available in Medan City in 2024. A laboratory-based experimental method was employed, including both qualitative and quantitative analyses. The procedure involved preparing test solutions, comparator standards for sibutramine e hydrochloride and furosemide, and thin-layer chromatography (TLC) and UV-Vis spectrophotometry. Qualitative analysis showed that out of 10 samples, one tested positive for furosemide. Quantitative analysis at 358 nm revealed a furosemide concentration of 7.79% in Sample B. No None of the samples contained sibutramine e hydrochloride. These findings highlight the potential adulteration of herbal products with synthetic pharmaceuticals, emphasizing the need for stricter quality control and regulations to ensure consumer safety.

**Keywords:** Jamu, Medicinal Chemicals, TLC, UV-Vis Spectrophotometry, Medan.

1. **INTRODUCTION**

Indonesian people are still lacking in maintaining their quality of life, one of which is the lack of maintenance of a good diet, resulting in obesity. Obesity is a condition in which an individual experiences excess fat, obesity, or excess fat accumulation due to an imbalance in energy intake received with energy used (1). The amount of energy that comes in comes from the food or drinks we consume (2). Obesity is celebrated every March 4 to raise awareness and concern of the global community regarding the importance of preventing and treating obesity by implementing a clean and healthy lifestyle (3).

Materials or ingredients in the form of plant materials, animal materials, mineral materials, or a mixture of these materials have been used for generations as a treatment, and can be applied in accordance with applicable norms are called traditional medicines. Traditional medicine is divided into several types, including herbal medicine. Jamu is a traditional Indonesian medicine made from a combination of ingredients or extracts from plants, animals, or minerals that have been used for treatment for generations (4).

The behavior of insulting the physical appearance of others is often a concern in society, so that the desire of obese people to control body weight in an easy and fast way (practical) arises, resulting in an increasing number of people turning to various slimming products made from natural ingredients, usually called slimming herbs (5).

Slimming can be done in two ways: naturally and with help. Naturally, maintaining an ideal body is accomplished by adjusting the diet and exercising regularly. This is beneficial because it is both healthy and physiological. However, many people are impatient to do so because the results will usually be seen over a long time span, for example, within six months. In line with the habits of metropolitan people who like fast or instant things, the choice to achieve ideal weight falls on fast and immediate results. For this reason, many obese people use slimming drugs, slimming supplements, and medical measures, as well as a variety of other ways that are considered the right choice for slimming. Slimming with the help of drugs is a cheaper option than medical measures, therapies, or others. There are two types of slimming drugs in the market: modern and traditional. Traditional slimming medicine is a preferred choice and trusted by the community. This is because some of its contents and dosage forms are familiar to the public (6).

Medicinal Chemicals are synthetic compounds or active chemicals that are used as the main ingredients in the production of chemical drugs or as finished products used in health (7). Medicinal chemicals in herbal medicine can be harmful to consumers due to contraindications to certain diseases suffered by patients. Another serious problem of consuming jamu containing medicinal chemicals is the occurrence of gastric perforation and kidney failure as side effects of the addition of these medicinal chemicals (8). Regulation of the Minister of Health of the Republic of Indonesia Number 007 of 2012 concerning Traditional Medicine Registration article (7) explains that Traditional Medicines are prohibited from containing several ingredients, one of which is medicinal chemicals that are the result of isolation or synthetic medicinal properties (9). The medicinal chemicals that are usually added to slimming herbs are furosemide and sibutramine HCl hydrochlorothiazide (1).

In a previous study conducted by Hibatullah et al. in 2022, four samples of slimming herbs contained sibutramine hydrochloride (1). In another study in Malang City, three out of four samples of slimming herbs contained sibutramine hydrochloride medicinal chemicals (10). Other studies using TLC and UV-Vis Spectrophotometry have also obtained two samples containing the chemical drug furosemide (11). The purpose of this study was to determine the content of BKO medicinal chemicals in herbal slimming products in Medan City using thin layer chromatography and Uv-Vis spectrophotometry. This study aimed to determine the presence or absence of medicinal chemicals in slimming herbs. This was chosen because the method used was simple.

1. **METHODOLOGY**

 This study employed an experimental laboratory approach to identify the medicinal chemicals in slimming herbal products using Thin-Layer Chromatography (TLC) and UV-Vis Spectrophotometry. Conducted at the Chemistry Laboratory of the Helvetia Institute of Health from June to July 2024, this research involved systematic sample preparation, standard comparator formulation, qualitative TLC analysis, and quantitative UV-Vis spectrophotometric measurements. Various laboratory tools and reagents were utilized to ensure the accuracy of the detection of sibutramine e hydrochloride and furosemide. The following subsections outline the research location, equipment, materials, and analytical procedures.

**2.1 Place and Time**

The research was conducted at the Chemistry Laboratory of the Helvetia Institute of Health from June to July 2024.

**2.2 Tools**

Analytical balance, beaker glass, enlemeyer, measuring flask, volume pipette, glass funnel, steam cup, magnetic stirrer, spatula, dropper pipette, capillary tube, stirring rod, filter paper, aluminum foil, cuvette, chromatography chamber, camag UV lamp at 254 nm, drying oven binder, TLC plate, and Uv-Vis spectrophotometry.

**2.3 Materials**

Ten Samples of slimming herbs, acetone, chloroform, n-hexane, 96% ethanol, methanol, ethyl acetate, Sibutramine Hydrochloride, Furosemide.

**2.4 Preparation of Test Solution of Slimming Herb Sample**

Each sample of slimming herb was weighed as much as 2.1 grams. The sample was placed into an enlemeyer, 10 ml ethanol was added, and the mixture was shaken with 96% ethanol until homogeneous, and then filtered into a beaker glass. The filtrate was poured into a porcelain cup and evaporated in a waterbath (12).

**2.5 Preparation of Sibutramine Hydrochloride Comparator Standard Solution for TLC**

Ten milligrams of sibutramine e hydrochloride chemical raw material was placed into an enlemeyer, dissolved in methanol, shaken until the omogen, and then filtered. The filtrate was then poured into a porcelain cup (12).

**2.6 Preparation of Furosemide Comparator Standard Solution for TLC**

22.5 mg of raw chemical drug Furosemide was dissolved with 96% ethanol in 25 ml in an Erlenmeyer .(11)

**2.7 Qualitative Analysis of Sibutramine Hydrochloride and Feurosemide Medicinal Chemicals by TLC Method**

The stationary phase preparation was performed with a silica gel GF 254 TLC plate with a size of 10x5 cm and 10 × 1.5 cm) activated by heating in the oven for 30 min at 120 °C, then given a line with a pencil at a distance of 1 cm from the top edge and 1 cm from the bottom edge to show the elution process preparation of mobile phase eluent sibutramine hydrochloride, namely acetone, chloroform, and N-hexane in the ratio (5:3:2) mixed, and then placed into the chamber to be saturated.(13) Testing with TLC, namely, the sample of jamu and sibutramine hydrochloride comparison standards are bottled on the TLC plate and then placed in a chamber that has been saturated with the mobile phase. Then, wait until the eluted mobile phase reaches its limit. If the eluent rises, the plate is lifted and dried/aerated. Observe the spot on the TLC plate with UV light at 254 nm, and calculate the RF value of the sample and standard comparison (12). The Rf value is also called the retention factor, which is the ratio of the distance traveled by the compound to the distance traveled by the solvent (14).

**2.8 Quantitative Analysis of Frusemide Medicinal Chemicals Using UV-Vis Spectrophotometry**

The furosemide standard solution (112.5 mg dissolved in 125 ml of 96% ethanol in an Erlenmeyer and stirred until homogeneous (11). Determination of the maximum wavelength by means of the absorption of 900 ppm solution was performed at a wavelength of 200-400 nm which served to determine the standard curve and measurement of the absorption of the test solution (11). The furosemide calibration curve was prepared by making a standard curve with concentrations of 20, 40, 60, 80, and 100 ppm. A total of 0.2 ml, 0.4 ml, 0.6 ml, 0.8 ml, 1.1 ml. Then, the absorbance of the standard solution was measured and linear regression was calculated.(11) Determination of furosemide content in slimming herbs by weighing 22.5 mg of each slimming herbs sample, put into Erlenmeyer dissolved using 96% ethanol as much as 25 ml. The sample solution was then homogenized using a magnetic stirrer for 5 min, and absorption at the maximum wavelength was measured to determine the chemical content of the drug in the sample.(11) .

**2.9 Qualitative Data Analysis**

Data were obtained from identification using the TLC method with stationary phase silica gel GF 254 with development distance and mixed mobile phase, saturation (filter paper), and spot appearance (UV light 254 nm). The TLC data were obtained by calculating the RF that has been obtained.

**2.10 Quantitative Data Analysis**

The levels of medicinal chemicals were determined by determining the regression value and calculating the coefficient of variation of the linear regression. The calculation of levels was performed using the formula y = a + bx. Simple linear regression was used to determine whether there was a significant influence between one independent variable (y) on one dependent variable (x), to determine how the effect (positive or negative) was, how big the effect was, and to predict the value of the dependent variable using the dependent variable (15).

**3. RESULTS AND DISCUSSION**

**3.1 Research Results**

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**Table 1.** Results of Rf Values of Slimming Herb Samples and Standard Comparator

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Sibutramine mobile phase sample** | **Stain distance** | **Eluent distance** | **Rf Value** |
| 1. | Sample A | - | - | - |
| 2. | Sample B | 7.7 cm | 8 cm | 0.96 |
| 3. | Sample C | 7.1 cm | 8 cm | 0.88 |
| 4. | Sample D | 6.6 cm | 8 cm | 0.82 |
| 5. | Sample E | 7.4 cm | 8 cm | 0.92 |
| 6. | Sample F | - | - | - |
| 7. | Sample G | - | - | - |
| 8. | Sample H | - | - | - |
| 9. | Sample I | - | - | - |
| 10. | Sample J | 6.4 cm | 8 cm | 0.8 |
| 11. |  Sibutramine e hydrochloride | 1.8 cm | 8 cm | 0.22 |

**Table 2:** Results of Rf Values of Slimming Herb Samples and Standard Comparator

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Furosemide mobile phase sample** | **Stain distance** | **Eluent distance** | **Rf Value** |
| 1. | Sample A | - | - | - |
| 2. | Sample B | 6.2 cm | 8 cm | 0.77 |
| 3. | Sample C | - | - | - |
| 4. | Sample D | 6.8 cm | 8 cm | 0.85 |
| 5. | Sample E | 6.9 cm | 8 cm | 0.86 |
| 6. | Sample F | - | - | - |
| 7. | Sample G | 7.4 cm | 8 cm | 0.92 |
| 8. | Sample H | - | - | - |
| 9. | Sample I | 6.8 cm | 8 cm | 0.85 |
| 10. | Sample J | - | - | - |
| 11. | Furosemide | 6.3 cm | 8 | 0.78 |

**Table 3.** Absorbance Measurement Data of Furosemide Standard Solution and Slimming Herb Samples

|  |  |
| --- | --- |
| **Concentration** | **Absorbance** |
| 0 | 0.004 |
| 20 | 0.214 |
| 40 | 0.313 |
| 60 | 0.431 |
| 80 | 0.590 |
| 100 | 0.719 |
| **Slimming Herb Sample** | **Absorbance** |
| Sample B | 0.474 (p1)0.511 (p2)0.574 (p3) |
| **Average** | **0.5196** |

**Table 4.** UV-Vis Spectrophotometric Quantitative Analysis Data

|  |  |  |  |
| --- | --- | --- | --- |
| **Sample B** | **Absorbance** | **Concentration** | **Content (%)** |
| P1 | 0.474 | 63.2 | 7.02 |
| P2 | 0.511 | 68.95 | 7.64 |
| P3 | 0.574 | 78.74 | 8.71 |
| $$\overbar{X}$$ | 0.5196 | 70.3 | 7.79 |

**3.2 Discussion**

Before conducting quantitative analysis on slimming herbal medicine samples, it is necessary to first identify whether there is medicinal chemical content in slimming herbal medicine samples using the thin layer chromatography (TLC) method. Based on the identification results using thin-layer chromatography on 10 samples of slimming herbal medicine, one sample was positive for furosemide medicinal chemicals. TLC results were observed under UV light at 254 nm to observe the stain formed, and the Rf value was calculated. When viewed under UV light at 254 nm, the spot appeared blue, and when viewed visually, the spot appeared faint blue after being sprayed with H2SO4 solution.

The spots were visualized, and the Rf values were calculated. For the standard comparison of furosemide drug chemicals, the Rf value was 0.78. For furosemide chemicals B, D, E, G, and I, the Rf values were 0.77, 0.85, 0.86, 0.92, and 0.85, respectively. For the standard comparison of sibutramine medicinal chemicals, the Rf value was 0.22. For sibutramine B, C, D, E, and J, Rf values were 0.96, 0.88, 0.82, 0.92, and 0.8, respectively. The result is declared positive if the difference in the Rf value between the comparator standard and sample is ≤ 0.05(16). It can be seen that the Rf value of furosemide comparator standard and sample B is positive for containing furosemide medicinal chemicals. However, the other samples did not meet the requirements. Judging by the Rf value of the standard sibutramine comparator, all samples did not meet the requirements, meaning that the sample was declared negative for sibutramine medicinal chemicals. In this study, the slimming herbs were not found to contain sibutramine and were declared safe from sibutramine medicinal chemicals. spots indicate the presence of certain compounds. If the spot had the same Rf value as the furosemide standard, this indicated that furosemide was present in the slimming herbs. In addition, other spots can come from herbal compounds, such as alkaloids, flavonoids, saponins, or tannins (17). The positive samples were then subjected to UV-Vis spectrophotometry to determine the levels of medicinal chemicals.

After obtaining a positive sample containing medicinal chemicals in the qualitative test, a quantitative test was performed using the UV-Vis Spectrophotometry method. For quantitative tests, the maximum wavelength of the furosemide solution was determined at a concentration of 900 ppm and a wavelength of 200-400 nm. The obtained wavelength was 358 nm. The next step was the measurement of the calibration curve of the furosemide solution with measurement concentrations of 20, 40, 60, 80, and 100 ppm. Furthermore, the absorption was measured at a wavelength of 358 nm. The equation from the regression calculation of the calibration curve above was obtained as y = 0.0673 + 0.006435x, with a relationship coefficient (r) = 0.9934. According to Sahumena et al. (2020), the coefficient is very good because it is close to 1 in accordance with the requirements and acceptance criteria for a correlation coefficient of > 0.997.

The next step was to determine the furosemide level in the slimming herbal medicine sample using Uv-Vis Spectrophotometry at a wavelength of 358 nm. The furosemide content in sample B was 8.71%. The concentration of furosemide in the slimming herbs was calculated by entering the absorbance value into the y value in the linear regression equation. In a previous study with similar identification conducted by Ramdan Aresta Permana in 2021, the results of previous research showed that two out of 10 herbal medicine samples were positive for furosemide because the Rf values of the samples and the standard comparison were close to each other. For the Uv-Vis spectrophotometric analysis, the levels in the previous study were higher, with an average content value of sample A 12.27% for sample B 8.90%. Furosemide is a diuretic. Furosemide causes weight loss through the loss of fluid, rather than fat. There are several reasons why furosemide is prohibited in slimming herbs; its side effects can cause body fluid deficiency (electrolyte depletion), which will likely cause hyponatremia, hypochloremic acidosis and hypokalemia, hyperuricemia, dehydration renal insufficiency or renal failure, antihypertension, and allergic reactions(18). According to the Regulation of the Minister of Health of the Republic of Indonesia No. 007 of 2012, traditional medicine is prohibited from containing medicinal chemicals that are isolated or synthetic products with medicinal properties and narcotics or psychotropic drugs (19).

1. **CONCLUSION**

Results of the identification of furosemide medicinal chemicals in 10 samples of slimming herbs based on qualitative analysis by Thin Layer Chromatography (TLC) using the mobile phase of ethyl acetate: methanol (6:4), there is 1 sample of slimming herbs, namely sample B, which positively contains furosemide medicinal chemicals For the level of furosemide medicinal chemicals contained in sample B of 7.79%.

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