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Original Article

Identification of Glibenclamide in Herbal Products Found in Medan Petisah

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Abstract

Glibenclamide is an antidiabetic drug that is not permitted for use in traditional herbal medicines because it can cause serious side effects such as hypoglycaemia and organ damage. This study aims to identify the presence of glibenclamide as a Chemicals Drug (CD) in antidiabetic herbal medicines found in Medan Petisah. Two herbal medicine samples, namely Unlabelled Powdered Herbal Medicine and JSR Diabetes Herbal Medicine (Jamu), were analysed using Fourier Transform Infrared Spectroscopy (FTIR). The infrared spectra of the samples were compared with the standard Glibenclamide spectrum to identify characteristic wavenumber patterns. The analysis results showed similarities in the patterns at 3280 cm^{-1} (N–H bond), 2922 cm^{-1} (C–H bond), and 1237–1282 cm^{-1} (S=O bond), confirming the presence of Glibenclamide in both samples. These findings indicate a violation of Indonesian Minister of Health Regulation No. 007 of 2012, which prohibits the use of Chemicals Drug (CD) in traditional preparations. Therefore, this study recommends strict supervision of the distribution of antidiabetic herbal medicines and public education about the dangers of consuming herbal medicines containing CD to prevent health risks.

Keywords: Antidiabetic Herbal Medicines, Chemicals Drug, Fourier Transform Infrared Spectroscopy, Glibenclamide, Infrared Spectrum.

1. Introduction

The use of traditional medicines made from natural ingredients continues to increase among Indonesians, mainly because they are believed to be safe, easily available, and have been used for generations (Kasole et al., 2019; Putri & Apsari, 2023). However, this trend is also accompanied by abuse in the form of illegal addition of Chemicals Drug (CD) or also known as *Bahan Kimia Oba*t (BKO) to herbal preparations (Kashuri, 2024), either consciously by manufacturers to increase efficacy or due to ignorance of the risks of their use. One of the Chemicals Drug (CD) commonly found in antidiabetic herbal medicines is Glibenclamide, a potent drug used in the treatment of type 2 diabetes mellitus (Maggadani & Sugianto, 2020).

Antidiabetic herbal medicines are one of the most widely consumed types of traditional medicines, especially among diabetes patients who require lifelong therapy (Aprilla, 2020; Desreza & Raiyani, 2023; Dwivedi & Daspaul, 2013). In some cases, antidiabetic herbal medicines have been found to contain Glibenclamide illegally, which can cause serious side effects such as hypoglycaemia, kidney damage, and cardiovascular complications (Mulkin et al., 2020; Syahfitr & Asra, 2021; Utami et al., 2019). This contradicts Indonesian Ministry of

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Health Regulation No. 007 of 2012, which explicitly prohibits the addition of pharmaceutical chemicals to traditional formulations.

Therefore, an accurate and efficient analytical method is needed to detect the presence of Glibenclamide in herbal remedies (Sudirman & Skripsa, 2020). Fourier Transform Infrared Spectroscopy (FTIR) is a spectroscopic method capable of identifying compounds based on their characteristic infrared absorption patterns (Ul Haq et al., 2022). This study aims to identify the content of Glibenclamide in antidiabetic herbal medicines found in the Medan Petisah area using FTIR as the primary analytical tool, thereby providing a basis for stricter oversight of traditional products and increasing public awareness of the risks associated with the use of unsafe herbal medicines.

2. Literature Review

2.1. Infrared Spectroscopy Theory

Infrared spectroscopy, particularly Fourier Transform Infrared Spectroscopy (FTIR), is a chemical analysis method used to identify compounds based on the absorption patterns of infrared light at specific wavelengths (Warono & Ab, 2013). This technique enables the detection of functional groups such as N–H, C–H, and S=O, which are characteristic of compounds such as Glibenclamide (Timbangen et al., 2019). FTIR has proven effective in the analysis of pharmaceutical chemical ingredients (PCIs) in herbal products due to its sensitivity and accuracy.

2.2. Glibenclamide as a Pharmaceutical Chemical Ingredient

Glibenclamide is an antidiabetic drug from the sulfonylurea class that works by increasing insulin secretion. However, its use in traditional herbal medicines is prohibited due to the risk of side effects such as hypoglycaemia and organ damage (Alexandra et al., 2023). Previous studies have shown that Chemicals Drug (CD) such as Glibenclamide are often illegally added to herbal medicines to enhance pharmacological effects, despite violating health regulations.

2.3. Research Related to Chemicals Drug (CD) in Herbal Medicines

Previous studies in Indonesia have detected CD in various herbal medicine products, including antidiabetic herbal medicines. However, most studies have used chromatography, while the use of FTIR for Glibenclamide detection is still limited. This study fills this gap by applying FTIR to analyse antidiabetic herbal medicines in Medan Petisah, providing a faster and non-destructive approach compared to conventional methods.

3. Methods

This study used a laboratory experimental approach to identify the presence of Glibenclamide as an active pharmaceutical ingredient (API) in antidiabetic herbal medicines found in Medan Petisah. The main method used was Fourier Transform Infrared Spectroscopy (FTIR), which enables qualitative analysis of compounds based on infrared spectra (Aprilla & Purwana, 2020). The following sections detail the research design, location and time, population and sample, equipment and materials, and procedures carried out.

3.1. Research Design and Location

This study is an experimental laboratory study aimed at identifying the presence of Glibenclamide in antidiabetic herbal medicines found in Medan Petisah. The testing process

was conducted at the Prima Indonesia University Laboratory in January 2024. This study involved two herbal medicine samples, namely Unlabelled Powdered Herbal Medicine and JSR Diabetes Herbal Medicine (Jamu), which were purposively selected from the Medan Petisah area.

3.2. Instruments, Materials, and FTIR Analysis Procedures

The instruments used in this study included Fourier Transform Infrared Spectroscopy (FTIR), cuvettes, 10–50 ml measuring flasks, dropper pipettes, volumetric pipettes, digital scales, and spatulas. The materials used were Glibenclamide BPFI as the standard, ethanol, distilled water, parchment paper, and the two herbal medicine samples.

The procedure began with the preparation of a Glibenclamide standard solution (400 ppm), followed by dilution to create a calibration curve at various concentrations. For testing, 2 grams of herbal medicine were brewed with hot water, then extracted using ethanol and dissolved in distilled water. The samples were tested using an FTIR instrument with a spectrum range of 4000–400 cm^{-1}, and the spectrum results were compared with the Glibenclamide standard spectrum to see the conformity of the infrared absorption pattern at the characteristic wave number.

4. Results and Discussion

4.1. Research Results

4.1.1. FTIR Spectrum Analysis Results

Analysis using Fourier Transform Infrared Spectroscopy (FTIR) was performed on two antidiabetic herbal medicine samples: Unlabelled Powdered Herbal Medicine and JSR Diabetes Herbal Medicine (Jamu). The FTIR spectra of each sample showed absorption patterns similar to the standard Glibenclamide spectrum, particularly at characteristic wave numbers indicating the presence of Glibenclamide functional groups.

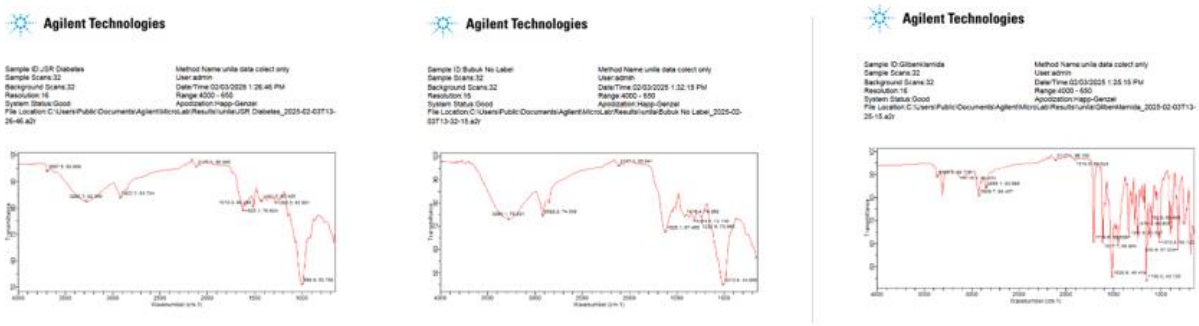

Figure 1. FTIR Spectrum of Glibenclamide, Unlabelled Herbal Powder, and JSR Diabetes Herbal Medicine (Jamu)

The spectrum shows similarity in absorption peaks at characteristic wavenumbers such as 3280 cm^{-1} (N–H), 2922 cm^{-1} (C–H), and 1237–1282 cm^{-1} (S=O) between the herbal medicine samples and the standard Glibenclamide.

4.1.2. Wave Number Table Data and Function Groups

The wave number data from the three spectra are compiled in Table 1, which shows the similarity of the function groups of the three samples.

Table 1. Comparison of Wave Numbers and Function Groups in Samples and Standard Glibenclamide

Wave Number (cm^{-1})	Possible Function Groups	Description
3280	N–H / O–H (stretching)	Visible across all spectra, characteristic of glibenclamide
2922	C–H aliphatic	CH_2/CH_3 stretch, present in all samples
1625	C=O / C=C aromatic	Indicates carbonyl and aromatic groups
1416–1431	C–N, CH_2 bending	Found in all samples, supporting the basic structure of sulfonylurea
1237–1282	S=O / C–O–C	Indicator of sulfonyl group
998–1013	C–N / fingerprint region	Identification enhancer for glibenclamide

4.2. Discussions

FTIR spectrum analysis of both herbal medicine samples showed absorption patterns that were very similar to the standard Glibenclamide spectrum. This similarity was evident in a number of characteristic wave numbers, such as 3280 cm^{-1} (O–H or N–H stretching), 2922 cm^{-1} (aliphatic C–H), 1625 cm^{-1} (aromatic C=O/C=C), and the 1237–1282 cm^{-1} region, which corresponds to the stretching of the S=O or C–O–C groups in the sulfonylurea structure. In addition, the peak at 998–1013 cm^{-1} located in the fingerprint region further confirms the presence of Glibenclamide.

This similarity was found not only in one, but in both herbal medicine samples, namely JSR Diabetes and Unlabelled Powder. This indicates that compounds with the characteristic functional groups of Glibenclamide—a potent sulfonylurea drug—are indeed present in the composition of these herbal medicines. The presence of S=O and N–H groups in the spectrum further confirms that these compounds are derivatives of Glibenclamide.

This finding confirms a violation of Indonesian Ministry of Health Regulation No. 007 of 2012, which prohibits the use of Chemicals Drug (CD) in traditional medicine formulations. The addition of Glibenclamide in herbal medicine products without medical supervision can cause serious side effects, including hypoglycaemia, kidney dysfunction, and cardiovascular risks that endanger consumer safety.

Overall, these results indicate that oversight of antidiabetic herbal medicine products on the market is still inadequate. In addition to enforcing regulations, comprehensive education is needed to inform the public about the dangers of consuming herbal medicines that provide instant effects, as they may contain undetectable pharmaceutical chemicals.

5. Conclusion

This study proves that two samples of antidiabetic herbal medicine found in Medan Petisah, namely Jamu JSR Diabetes and Jamu Bubuk Tanpa Label, contain Glibenclamide, which was identified through Fourier Transform Infrared Spectroscopy (FTIR) analysis. The similarity in spectral patterns between the two samples and the standard Glibenclamide spectrum is evident at characteristic wavenumbers such as 3280 cm^{-1} (N–H), 2922 cm^{-1} (C–H), and 1237–1282 cm^{-1} (S=O), which serve as primary indicators of the presence of Chemicals Drug (CD) in the herbal medicine formulations.

These results indicate that the illegal addition of CD to herbal medicine products still occurs and poses a serious risk to public health. Therefore, stricter supervision by the authorities and ongoing education of the public about the dangers of consuming herbal medicine containing pharmaceutical chemicals are needed.

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