Hypoglycemia Due to the Consumption of an Unidentified Compound for Weight Gain: A Case Report

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Abstract

This case report highlights the adulteration of over-the-counter weight gain supplements with undeclared glyburide, culminating in a life-threatening episode of hypoglycemia in a healthy young adult. A previously healthy 23-year-old man was admitted to the emergency department on April 10, 2022, following a brief episode of unconsciousness. Upon arrival, his blood glucose was found to be 30 mg/dL. He reported having taken one herbal weight-gain tablet daily for the preceding three days. His blood glucose level quickly returned to normal after an intravenous dextrose infusion. Liquid chromatography-mass spectrometry (LC-MS) analysis of the tablets detected the presence of glyburide. The patient did not experience any further hypoglycemic episodes while being monitored and was discharged in stable condition after a four-day hospitalization. This case highlights the significant risk posed by undeclared sulfonylurea adulteration in unregulated herbal supplements, as well as the importance of implementing routine post-market quality control and toxicological screening to protect public health and prevent serious adverse events.

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Introduction

Recent global studies indicate a rising prevalence of obesity and overweight. While the range of available weight-loss treatments and interventions has expanded, a growing segment of the population is actively seeking methods for weight gain. This trend is particularly evident among young men, with the primary objective being the enhancement of muscle mass. Fueled by aesthetic ideals and athletic performance purposes, a trend often driven by media portrayals of idealized body types (1-4), the use of different substances—from nutritional supplements to unregulated or experimental medicines—is currently widespread among a substantial portion of the general male population, not just professional athletes (5). One of the main concerns is the high consumption of protein powders and other nutritional supplements by young men. These supplements may serve as a gateway to more dangerous drugs for improving one's appearance and athletic abilities (6, 7).

There is a widespread, yet unsubstantiated, belief that herbal products are inherently safe and free of side effects. Regretfully, the ingredients in these products often lack standardization since they are not subject to regulatory oversight. A recent study of herbal shops in Tehran found that 9% of weight-gain supplements were adulterated with undeclared pharmaceutical ingredients (8). Despite the potential for severe health consequences, there is a scarcity of clinical reports documenting adverse effects associated with these adulterated weight-gain supplements.

The presence of glyburide-like contaminants in herbal weight-loss supplements poses a significant, yet often overlooked, risk of inducing severe hypoglycemia. In

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2022, the "Center for Food Safety and Applied Nutrition (CFSAN) Adverse Event Reporting System" (CAERS) database documented several instances of hypoglycemia associated with herbal products. These findings, derived from post-market surveillance, underscore the critical necessity for ongoing safety monitoring of herbal products, given their potential to interfere with blood glucose regulation (9).

Case Presentation

On April 10, 2022, a 23-year-old man was admitted to the emergency department exhibiting symptoms of weakness and lethargy, which progressed to an episode of syncope. Upon arrival, his vital signs were stable (blood pressure [110/70 mmHg], heart rate [75 beats per minute], respiratory rate [16 breaths per minute], body temperature [37.3ºC], and oxygen saturation [98%]). Physical examination revealed no notable findings, and his blood glucose level was recorded at 30 mg/dL upon presentation.

The patient's past medical history was unremarkable for any chronic illnesses. He reported no use of tobacco, alcohol, or illicit substances, and there was no personal or family history of diabetes mellitus. With a weight of 65 kg and a height of 165 cm, his body mass index (BMI) was 23.89 kg/m². The patient denied any recent considerable changes in appetite, dietary intake, or body weight. Except for the recent use of weight gain pills, the patient had no previous medical or pharmacological history. He reported taking a tablet for weight gain, purchased from an herbal store, earlier on the day of admission. Shortly thereafter, he experienced lightheadedness and weakness. He had been using these tablets for three days. All laboratory findings, including blood electrolytes, hepatic function tests, and calcium and phosphorus levels, were within normal ranges (Table 1).

Table 1. Laboratory Results

Lab Test	Result	Normal Range	Lab Test	Result	Normal Range
Urea	33	18-55 mg/dl	Ca	10.2	8.5-10.5 mg/dL
Cr	1	0.6-1.2 mg/dL	P	3.8	2.6-4.5 mg/dL
AST	21	38 IU/L	Mg	2	1.8-2.6 mg/dL
ALT	10	35 IU/L	Na	138	135-145 mEq/L
ALP	148	80-306 IU/L	K	4	3.5-5.1 mmol/L
BR(Direct)	0.2	0.1-1.2 mg/dL	ALB	4.2	3.5-5.3 g/dl
BR(Indirect)	0.9	< 0.3 mg/dL	PT	13.5	10-14 seconds
CPK	300	25-195 mcg/L	PTT	25	27-45 seconds
Amylase	95	< 110 U/L	INR	1.2	0.8-1.3
Lipase	30	< 60 U/L	Hb	11.6	14.5-18.5 g/dl
ESR	18	(Age+10)/2 mm/hr	WBC	6000	4.5-11 × 10^9/L
CRP	3	< 6 mg/dL	RBC	4.27	3.9 - 5.5 × 10^6/µL

ALB: Albumin, ALP: Alkaline phosphatase, ALT: Alanine Transaminase, AST: Aspartate Transaminase, BR: Bilirubin, BUN: Blood Urea Nitrogen, Ca: Calcium, CRP: C reactive protein, CPK: Creatine Phosphokinase, Cr: Creatinine, ESR: Erythrocyte Sedimentation Rate, Hb: Hemoglobin, INR: International Normalized Ratio, K: Potassium, Mg: Magnesium, Na: Sodium, P: Phosphorus, PT: Prothrombin time, PTT: Partial thromboplastin time, RBC: Red Blood Cell, WBC: White Blood Cell

Upon presentation, the patient's electrocardiogram was unremarkable. Initial venous blood gas analysis demonstrated a pH of 7.35, a bicarbonate (HCO3) concentration of 27.5 mEq/L, and a partial pressure of oxygen (PO2) of 54.3 mmHg. The patient's symptoms showed complete resolution within 10 minutes of receiving an intravenous glucose infusion. The patient was subsequently admitted to the emergency department for close observation, with blood glucose levels monitored every 15 minutes. After achieving clinical stability and symptomatic improvement, he was transferred to the internal medicine department for ongoing care and management. During the patient's hospitalization, a continuous intravenous infusion of 10% dextrose in water was administered at a rate of 100 cc/hr. Blood glucose levels were monitored every 6 hours (Table 2).

Table 2. Blood Glucose (mg/dl) Chart

Time (hr) in each Day of Hospitalization	Day of Hospitalization		
	First day	Second day	Third day
6	202	101	111
12	210	127	121
18	145	124	101
24	126	105	121

The patient did not experience any recurrent episodes of hypoglycemia. A specific protocol was implemented, mandating that if blood glucose levels decreased to below 55 mg/dL, a blood sample would be sent for analysis of glucose, insulin, and C-peptide concentrations. In light of the absence of recurrent hypoglycemic episodes following a 72-hour fasting period, we did not measure the patient's insulin, proinsulin, C-peptide, or cortisol levels. After excluding other potential causes, including adrenocortical and pituitary insufficiency, hyperinsulinemia, hepatic or renal diseases, and alcohol use, the hypoglycemic event was attributed to the weight gain pills. Subsequently, samples of these pills were dispatched to a specialized laboratory for comprehensive analysis of their active components.

The patient had purchased the pills from an herbal store, where they were marketed as a completely natural product. According to the brand's claims, the product contains magnesium oxide, zinc, dehydroepiandrosterone (DHEA), Ginkgo biloba, vitamins B1, B2, and B12, and vitamin C, with a specific assurance that it contains no hormonal substances or corticosteroids. The manufacturer asserts that the product can significantly and consistently increase appetite without causing adverse effects like drowsiness. Furthermore, the brand promotes the product as being exclusively made from herbal ingredients, appropriate for use by both men and women, and promises a weight gain of 8 to 12 kilograms over a single course of use.

The pills' active compounds were analyzed via gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-mass spectrometry (LC-MS). The LC-MS spectrum of the pills specifically indicated the presence of a sulfonylurea compound.

As depicted in the figure, a prominent peak at a molecular weight of 516 g/mol was identified, corresponding to the presence of the glyburide compound. This substance is a plausible cause for the patient's observed hypoglycemia, which subsequently stimulated appetite and led to weight gain. Regrettably, the quantity of glyburide in the tablets could not be determined. A valuable alternative would have been to quantify glyburide concentrations in the patient's blood; however, consent for this procedure was not granted. Following a four-day hospitalization, the patient was discharged in stable condition with normal vital signs.

Discussion

Recent research on weight management has shed light on the notable variations in how individuals perceive energy balance, which is the causal relationship between calories burned and calories consumed. This variability may denote a person's susceptibility to weight gain (10). A critical aspect of this issue is the importance of ongoing assessment and education about the numerous factors that influence body weight (11).

A significant rise in the pursuit of weight gain, specifically for the purpose of increasing muscle mass, has been observed among young men in recent years. This trend is fueled by both aesthetic preferences and athletic objectives, resulting in the prevalent use of a diverse array of substances from dietary supplements to unauthorized or experimental compounds (12).

The potential health risks linked to the use of these compounds are often overlooked due to their promise of swift physical changes and easy availability (13). Crucially, the use of these substances is not limited to professional athletes (14). A considerable number of young men in the general population are influenced by media portrayals of ideal physiques and, as a result, use these substances to gain weight (15). Although some products, such as protein supplements and creatine, have been thoroughly researched and are considered safe when used as directed, other substances, specifically hormonal and medicinal agents, are associated with considerable health risks (16). A number of medications, including thyroid hormones, corticosteroids, and antihistamines, are known to stimulate appetite and cause weight gain, a phenomenon well-documented throughout history and in current clinical practice (17). Antidiabetic agents, particularly insulin, insulin secretagogues, and thiazolidinediones, are known to be linked to an increase in body weight (18). However, it is important to note that the extent of weight gain and the risk of adverse effects can vary significantly among individuals within these drug classes. A notable example is glyburide, a sulfonylurea; a single 5 mg dose has been reported to induce severe hypoglycemia and coma in healthy, non-diabetic adults (19-21). Similar to other sulfonylureas, glyburide enhances insulin secretion by targeting the sulfonylurea receptor 1 (SUR1) subunits of adenosine triphosphate (ATP)-sensitive potassium channels in pancreatic beta cells (β-cells). Its glucose–lowering impact is magnified in individuals with high baseline insulin sensitivity and a significant need for muscle glycogen replenishment (22). Consequently, in numerous countries, sulfonylureas are intentionally added to herbal and dietary supplements that are purported to lower blood glucose. Thus, there has been a swift increase in the development of analytical and detection methodologies for these agents within such products (23, 24). This report also documents a case in which a young man suffered from severe hypoglycemia and impaired consciousness after ingesting a weight gain tablet contaminated with glyburide. The report highlights that without prompt medical intervention

or continued product use, the patient may have faced the risk of irreversible complications.

It is worth noting that medications for weight gain should only be indicated for specific conditions like severe cachexia in cancer or acquired immunodeficiency syndrome (AIDS), and require a physician's prescription and supervision. In contrast, many widely available supplements sold as muscle-mass enhancers, such as certain minerals, steroid hormones, and amino acids, have been shown to be ineffective or pose significant safety risks, often without strong evidence of their efficacy (25, 26).

Conclusion

The increasing societal focus on weight and muscle gain, particularly among young men, has led to a surge in the use of various herbal products, supplements, and medicines. Consequently, there has been a rise in associated side effects. A significant issue is the misrepresentation of some of these products as purely herbal, when they in fact contain chemical compounds. This deceptive advertising capitalizes on the public's perception of herbal remedies as being side-effect-free, thereby boosting sales. This situation underscores the critical need for stricter regulation and oversight of products sold in herbal stores to be sure of their authenticity and safety.

Conflict of Interest

The authors have no conflicts of interest – personal, professional, or financial – to disclose.

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