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THE IMPACT OF ARTIFICIAL SWEETENERS ON INSULIN RESISTANCE IN WOMEN WITH POLYCYSTIC OVARY SYNDROME (PCOS): A LITERATURE REVIEW

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ABSTRACT

Background: Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders, affecting up to 20% of women of reproductive age worldwide. A central feature of PCOS is insulin resistance (IR), which contributes to hyperandrogenism and worsens reproductive and metabolic symptoms. Given the growing prevalence of PCOS and the widespread use of artificial sweeteners (AS) as sugar substitutes, their potential influence on metabolic health in this population warrants closer examination.
Aim: This review aims to assess the current literature on the effects of artificial sweeteners on insulin resistance in women with PCOS, to determine whether their use may exacerbate or mitigate metabolic dysfunctions associated with the syndrome.
Methods: A narrative literature review was conducted using the most recent and relevant publications. The review focuses on the biochemical and physiological mechanisms of AS, including their effect on cephalic phase insulin secretion, pancreatic beta-cell response, gut microbiota composition, and hormonal signalling related to glucose metabolism and insulin sensitivity.
Results: The impact of AS on metabolic health appears to be heterogeneous and dose-dependent. Some sweeteners, such as saccharin and sucralose, may influence insulin secretion and gut microbiota in ways that contribute to glucose intolerance and IR. However, evidence is inconsistent and varies by sweetener type and study model. In PCOS patients, where IR is a core pathological feature, the use of certain artificial sweeteners may potentially worsen metabolic outcomes.
Conclusion: Artificial sweeteners are not metabolically inert and may affect insulin resistance in women with PCOS. Further research is needed to evaluate individual AS compounds and their long-term metabolic effects in this population, in order to inform dietary recommendations and optimize treatment outcomes.

KEYWORDS

PCOS, Insulin Resistance, Artificial Sweeteners, Obesity, Gut Microbiome, Glucose Tolerance, Diabetes Mellitus Type 2

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1. Introduction:

Polycystic ovary syndrome (PCOS) is an endocrine disorder, affecting even 20 % of women in their reproductive age worldwide [1]. Continuously rising number of patients diagnosed with PCOS is believed to be an effect of higher awareness of this condition in society and better availability of ultrasound. As it is considered to be the reason of up to 80% patients with anovulation it is crucial to move this topic in literature and find ways to enhance the quality of life of patients suffering from PCOS [2]. Although most women with PCOS say their quality of life is good or very good there are women who report a lower quality of life and are more likely to notice how PCOS affects their lives. They feel powerless over the condition, suffer from depression and are dissatisfied with their physical appearance. Therefore, for many women with PCOS, the assistance of experts such as endocrinologists, gynecologists, and nutritionists becomse essential. Maintaining a balanced diet, exercising frequently, and leading a healthy lifestyle can all help manage the problematic symptoms of PCOS and improve overall quality of life. It is equally important to look for psychological help when dealing with emotional problems, as well as support and acceptance from relatives [3]. The mechanism of the condition is complex but research have shown a close link between PCOS and obesity [4] which leads to higher risk of development endometrial cancer[5]. The obesity is more probably than not associated with impaired glucose tolerance [6] due to the insulin resistance [7]. Artificial sweeteners (AS) became an ubiquitous sugar substitute in food and beverages and are more and more popular as an ingredient which restrict energy intake and should help lose weight. However, the real effect of AS is being a topic of debates[8]. Despite conducting many studies through the years, their outcome was usually uncertain, and results differ between animal and human models [9–12]. The main aim of the review is to systemize knowledge about effect

of AS on the general health of patients with the PCOS especially its effect on insulin resistance and ways to enhance women diagnosed with this condition quality of life using the most up-to-date information found in literature and to point out areas where more research need to be done.

2. Current knowledge of PCOS mechanism and risk factors

According to the modified Rotterdam criteria, PCOS is still a common disorder that can be diagnosed if at least two of the following criteria are met: biochemical or clinical hyperandrogenism; oligo-anovulation evidence; and ultrasound-observed polycystic ovarian morphology [13]. The two most prevalent symptoms among PCOS patients are irregular menstruation (70.95%) and hirsutism (71.25%). These findings are consistent with recent research that found that 75–85% of PCOS patients have irregular menstrual cycles and 70–80% have hirsutism. Additionally, a significant portion of patients (53.9%) reports feeling depressed, which is consistent with the findings of a meta-analysis and systematic reviews. Additionally, weight gain (34.57%), excessive hair loss (38.12%), abdominal obesity (43.88%), and acne (49.52%) are other prevalent symptoms observed in this group of women.

Although knowledge of precise mechanisms resulting in PCOS remains unknown, researchers were able to identify some risk factors which play a crucial role in the development of this condition. These can be grouped into external and internal factors. To the first group, we can assign epigenetic mechanisms, environmental toxicants, physical and emotional stress, and diet. The second group consists of insulin resistance, hyperandrogenism, inflammation, oxidative stress and obesity [14]. In terms of hyperandogenism age affects the relationship between biochemical and clinical measures of hyperandrogenism. In younger PCOS patients, there was a stronger association between biochemical and clinical hyperandrogenism [15]. Hyperandrogenism can present clinically as hirsutism, acne, or androgenic alopecia. Nevertheless hirsutism is a more specific form of hyperandrogenism than acne or alopecia [16, 17]. In younger women with PCOS, free androgen index (FAI), which is a ratio of total testosteron and sex hormone-binding globulin [18], was a key factor in clinical hyperandrogenism, while in older women with PCOS, Dehydroepiandrosterone (DHEA), dehydroepiandrosterone sulfate (DHEA-S), and dihydrotestosterone (DHT) were more significant [15].

It is easy to see that many of those risk factors are also being assigned to PCOS as its symptoms so there is no wonder why it is so hard to determine which are reasons and which are the effect of PCOS due to their bidirectional correlation. For instance, obesity, which is excessive accumulation of fat tissue conducts to development of insulin resistance due to surplus secretion of adipokines by adipocytes which effects in reduced receptors sensitivity to insulin [19] but at the same time insulin resistance is being considered a risk factor of the condition. More than 65% to 95% of women with PCOS exhibit measurable compensatory hyperinsulinemia, above and beyond that determined by their degree of obesity, according to several studies. These women also exhibit insulin resistance (IR) in target tissues, such as skeletal muscle, adipose tissue [AT], and liver. This malfunction raises the likelihood of metabolic syndrome and type 2 diabetes mellitus (DM2), two conditions that are major risk factors for cardiovascular disease [20]. It is also linked to common metabolic and dermatological abnormalities that burden patients psychologically and raise their chance of developing other comorbid conditions [21] even such as depression which prevalence in women suffering from PCOS ranges up to 55% [22]. These signs and symptoms are reflections of the hyperandrogenism linked to PCOS.

As insulin resistance worsens hyperandrogenism symptoms, creating a vicious cycle that contributes to the development of PCOS [23] every element that contributes to the onset of insulin resistance is crucial. Better understanding of pathophysiological pathways involved is crucial since insulin resistance plays a significant role in the development of PCOS [24].

It is important to remember that not only factors like genetics and toxicants take a part in the progression of the disease but also diet which may be seen by others as a low importance element can actually play a huge role. It turns out that globally used food additives which were considered beneficial for metabolic condition can actually impair glucose tolerance due to insulin resistance which onset may be correlated with supply of additives such as artificial sweeteners.

3. The artificial sweeteners diversity

First so-called low-calorie sweetener (LCS) – saccharin - was found in late 1800's and was intended for the treatment of diabetes mellitus as it was believed to improve those patients' condition. It hasn't reach general population until World War II when poverty and bad economic situation of many countries including shortages in food and also in sugar made people use LCS as sugar supplement [25]. LCS started to be used globally as a healthier sweetener than sugar itself and the belief in their beneficial effects on health continues to this day although last research suggests that artificial sweeteners tend to have negative impact on metabolic condition [12]. However, similar to other food additives, sweeteners must adhere to stringent safety regulations. Acesulfame K (E950), aspartame (E951), cyclamates (E952), saccharin (E954), sucralose (E955), and steviol glycosides (E960) are the most prominent of the 19 compounds currently permitted for use in food products by European regulations. Seven of these compounds are classified as polyols, or low-calorie sweeteners when the rest is called non-calorie sweeteners. Despite having distinct chemical structures, non-sugar sweeteners (NSS) all have the capacity to strongly activate a few of the several possible ligand-binding sites of the sweet-taste receptors in humans [26].

4. Role in Weight Management

In an attempt to combat the obesity epidemic, AS are being utilized more and more as healthy substitutes for goods that include added sugar. Nevertheless, there is conflicting data to support their usage for weight loss or maintenance. There was no statistically significant difference in body weight between those who received ASs and those who received different sugars or a placebo, according to a meta-analysis of 56 trials, 17 of which were randomized controlled trials (RCTs). A subgroup examination of this trial, however, revealed that eating ASs was linked to more weight loss than eating a placebo or caloric sweeteners. Another study found that drinking artificially sweetened beverages was associated with both an increase in abdominal obesity (measured by waist circumference) throughout the nine-year follow-up and an elevated body mass index, which was observed in over 5,000 persons followed for eight years [27].

Extensive research has also been done on the growing trend of substituting artificially sweetened beverages for water. Over 24 ounces of artificially sweetened beverages resulted in a larger degree of weight loss than the group that drank the same amount of water in a randomized controlled trial that evaluated 300 overweight or obese individuals. In a different RCT, substituting an artificially sweetened beverage for water resulted in greater weight loss after a year [27].

A low-calorie diet is frequently advised for patients preparing for bariatric surgery in order to encourage preoperative weight loss and lower the risk of postoperative complications. In those cases, ASs have been added to low-energy foods to improve their flavour [27].

5. AS impact on gastric tract

5.1 Cephalic phase insulin secretion

The cephalic phase of insulin secretion is the initial release of insulin in response to dietary stimuli that operate on head and oropharyngeal receptors. The duration of these physiological insulin reactions is 10 minutes. Participants in the study ran in 2022 were healthy, fasting humans who rinsed their mouths with eight different tasting solutions for forty-five seconds before spitting them out. The taste stimuli were administered in a randomized order on different days and were not ingested. Three minutes prior to and three, five, seven and ten minutes following taste stimulation, blood was drawn in order to measure the amounts of plasma glucose and insulin. Following stimulation with sucrose and saccharin, there was a noticeable rise in the levels of plasma insulin. The only substance that induced a cephalic-phase insulin response was saccharin [28]. Following only these results it is possible to see we can't perceive artificial sweeteners as a homogenic group having one specific effect on human metabolic function but as a group of many different substances with different impact on homeostasis and should be considered individually.

5.2 Insulin Secretion

The research results showing AS impact on insulin secretion may seem not to be coherent due to different observations. Studies performed on rats' pancreas showed following effect. Islet cells express receptors for sweet tastes. In isolated perfused pancreases from rats, insulin secretion was unaffected by the physiological dosage of artificial sweeteners (50 μM saccharin). Nevertheless, via activating taste receptor signalling, a high dosage of artificial sweeteners (50 mM saccharin, 50 mM sucralose, or 50 mM ACE K) increased insulin secretion. These findings imply that the metabolic phenotypes brought on by artificial

sweeteners can be influenced by the quantity of the sweetener, which is in line with human research showing that artificial sweeteners have no effect on insulin levels because of their far lower intake when compared to sugar [28]. However in 2011, de Koning et al. conducted a study that examined the relationship between the development of DM2 and the use of sugar-sweetened beverages (SSB) and artificially sweetened beverages. The incidence of DM2 rose with increased consumption of artificially sweetened beverages, which may indicate a mechanism of insulin resistance over time [11]. Sugar-sweetened beverages and the development of LADA were positively correlated, according to a different study conducted in 2016 by Löfvenborg [29].

According to research on rats published in 2019, sucrose or sucralose raises the T1R2 and T1R3 taste receptors, which in turn stimulates the intestines and the bloodstream to produce more GIP and GLP-1, which results in hyperinsulinemia [9].

However, results reached in human trials have shown different outcome. The main indirect mechanism by which ASs may affect gastrointestinal tract is their effect on its motility through change in serotonin and incretin hormone production [27].

Following those research and results it seems the number of conducted studies is insufficitent for the clear statement wheter AS lead to insulin resistance in human organism but it is possible to notice they are not inert for health and this is why more detailed research need to be done as it may aggravate patients' insulin resistance and this way worsen symptoms of individuals suffering from PCOS.

5.3 Guts microbiota alternation induced by AS

Article published in Nature in 2014 links negative effect of non-caloric artificial sweeteners (NAS) intestine microbiota. In addition to identifying NAS-altered microbial metabolic pathways that are connected to host vulnerability to metabolic illness, they also show that healthy human patients exhibit comparable NAS-induced dysbiosis and glucose intolerance.[30]. However, article published in 2020 show that every NAS should be considered individually since some polyols, like erythritol, sorbitol, and mannitol, have no effect on the gut microbiota's composition, moderate amounts of polyols may cause changes in the gut microbiome in healthy individuals [31]. As the newest research show the alternation of intestine microbiota may cause inflammation resulting in insulin resistance [32]. This is why change of dietary habits such as using AS instead of regular sugar shouldn't be advised patients with PCOS as in effect it can worse their insulin resistance.

According to a number of animal studies, giving rats ASs resulted in a dose-dependent increase in the amount of soluble polysaccharides in the feces, a decrease in the anaerobe to aerobe ratio, and a noticeable increase in the mass of cecal contents. These changes increased the amount of carbohydrates available for the gut microbiota. The average amount of ammonia in the cecal contents rose by 30–50% when ASs was used for longer than 20 weeks. Researchers hypothesized that this was one way ASs impacted the gut flora because multiple bacterial enzymes showed a drop in activity at the same time. It has been observed that ASs change how intestinal bacteria metabolize amino acids, which leads to the production of carcinogenic compounds. Furthermore, scientists have hypothesized that saccharin may hinder intestinal protein digestion, which would increase bacterial metabolism... Bifidobacterium, Lactobacillus, and Bacteroides levels were significantly lower in the AS group than in the control group in an RCT comparing ASs (sucralose and maltodextrin) to a control group. It did not, however, have any appreciable effect on enterobacteria. P-glycoprotein and CYP450 enzyme levels in the intestines were higher and the pH of the stools rose when sucralose and maltodextrin were combined [27].

It shows due to alternation in gut microbiota AS have negative effect not only on condition of PCOS patients but also can lead to higher risk of cancer because of flora's carcinogenic compouds production.

6. Correlation between insulin resistance and metabolic condition

A number of metabolic abnormalities, including increased aromatase activity and androgen production, as well as decreased progesterone synthesis in granulosa cells, are closely associated with insulin resistance in PCOS patients. According to a 2018 study, insulin resistance in PCOS patients was very similar to that seen in pre-diabetic individuals [33]. At the 2015 congress on the assessment and treatment of PCOS and long-term risks, endocrinologists from the American College of Endocrinology (ACE) and the PCOS association highlighted the critical role that IR plays in the pathophysiology of PCOS by causing hyperandrogenism and oligomenorrhea through unidentified mechanisms. Many PCOS-related conditions, such as obesity, ovulatory failure that results in infertility or subfertility, impaired glucose tolerance (IGT), and ultimately diabetes mellitus, are also brought on by IR [34].

7. Insulin resistance treatment methods

There are two main approaches in insulin resistance treatment pharmacological and non-pharmacological. Despite the possibility of side effects, non-pharmacological therapies—such as food, nutritional supplements, physical activity, and herbal medicines—are commonly preferred over pharmaceutical treatments. Some supplements such as methyl donors, antioxidants, vitamin D, Coenzyme Q_{10}, N-acetylcysteine are known for their positive impact on PCOS patients although mechanistic studies based on biochemistry are needed to distinguish these supplements and understand their potential in combination therapy. Women with PCOS have a high prevalence of vitamin D deficiency, leading to the high preference for dietary supplementation. In addition, antioxidant supplements have been shown to have several beneficial effects in the treatment of PCOS as they improve IR, fasting blood insulin, and glucose levels in women with PCOS [35]. Methyl donor supplements, antioxidants, and proper protein diet can also help decrease toxic oxidants and preserve maturation of eggs [36].

7.1 Pharmacological intervention

There is currently no known cure for PCOS; instead, treatment aims to improve quality of life, reduce symptoms, and avoid long-term issues like cardiovascular disease and endometrial cancer [37]. PCOS is managed by a multidisciplinary team. In order to reduce weight and treat insulin resistance and hyperandrogenism, particularly in women who are overweight or obese, metformin medication in conjunction with conservative management or even bariatric surgery has been advised [38]. Oral contraceptives appear to be the most often advised medication for treating menstrual irregularities and hormonal imbalances, however other often used medications include metformin, cyproterone acetate, and drospirenone [39]. To enhance endocrine and metabolic profiles, the pharmaceutical option involves taking oral insulin sensitizers such as metformin, thiazolidinediones, inositol and other drugs commonly used in DM-2 to improve tissue response to insulin and reduce weight. Metformin use is associated with ovulation and enhanced menstrual cyclicity in women with PCOS. Its primary clinical role is to reduce hepatic glucose synthesis, which increases insulin sensitivity in peripheral tissues while lowering intestinal glucose uptake. Metformin also reduces fasting serum insulin by around 40% [40]. The results have shown using combination of myo-inositol with d-chiro-inositol and metformin combined with thiazolidinediones have superior effect than using metformin alone [41]. Numerous remedies, such as photoepilation, topical eflornithine, anti-androgen drugs, and hormonal contraceptives, have been proposed for hirsutism and acne [39, 42]. When it comes to treating infertility, lifestyle modifications are seen to be the best way to induce anovulation. Letrozole is then used to induce ovulation pharmacologically, but this is not advised for overweight women [43]. As a last resort, in vitro fertilization has been suggested, but other treatment options include gonadotropins or laparoscopic ovarian drilling [39, 44]. However, a number of current medicines have negative side effects. For example, weight increase is associated with the usage of oral contraceptives (OCPs).[45] The use of metformin is linked to gastrointestinal (GI) issues [46] and ovarian hyperstimulation syndrome is far more probable to occur after in vitro fertility treatments [47].

7.2 Non pharmacological intervention (NPI)

The modified Ferriman Gallwey score (mFG) rates nine androgen sensitive areas based on the quantity of hair growth and is valuable for documentation. Scores range from 0 (no terminal hair) to 4 (completely covered) [17].

The meta-analysis reviewing 21 studies published in the beginning of 2025 shows NPIs beneficial effect on exacerbation of PCOS symptoms [48]. They examined mFG data to confirm whether the increase in serum testosterone levels brought about by NPIs had clinical importance in PCOS symptom management, and they found that NPIs significantly raised mFG ratings. When matched with the Minimum Clinically Important Difference (MCID) value, this indicates that NPIs' effects on testosterone levels contribute to a reduction in PCOS symptoms. According to earlier research, hyperandrogenism in PCOS is linked to inflammatory reactions, dysregulation of the hypothalamic-pituitary-ovarian (HPO) axis, high insulin levels, and excessive androgen production. Hyperinsulinemia can exacerbate PCOS symptoms by inhibiting SHBG and increasing ovarian androgen production. Their team's experimental findings and recent evidence-based research indicate that NPIs have multidimensional potential in the treatment of PCOS. Exercise and dietary changes, for instance, can improve hormonal balance, lower chronic inflammation, and increase insulin sensitivity. By improving metabolism and fat distribution, low-carb and low-sugar diets may help PCOS patients experience less chronic inflammation. Studies show that probiotic supplements or higher fibre intake can improve the gut microbiome,

which in turn indirectly regulates androgen levels. This suggests that gut microbiota imbalance is also strongly related to the metabolic problems in PCOS. Nevertheless, precise recommendations for the kinds of exercise and food that should be adhered to are lacking [39]. Their study also discovered that by altering the GnRH/LH pulse frequency, electroacupuncture can decrease the expression of ovarian cytochrome P45017α, which inhibits androgen synthesis and improves the reproductive cycle and ovarian morphology in PCOS model rats [48, 49].

Individuals with PCOS are advised to engage in between 150 to 300 minutes of moderate-intensity or 75 to 150 minutes of vigorous-intensity aerobic activity each week, which corresponds with the physical activity recommendations for the general population [50]. Skeletal muscle has been found to play an important role in exercise-induced glucose uptake by promoting the translocation of glucose transporter type 4 (GLUT4) to the plasma membrane, which promotes glucose uptake. Insulin regulates GLUT4, which belongs to a class of glucose transporter proteins that promote glucose transport across the plasma membrane. Studies have highlighted the importance of adenosine monophosphate-activated protein kinase (AMPK), which can be activated by physical activity in an intensity- and volume-dependent manner, in regulating the post-exercise increase in glucose uptake and sensitivity to insulin [51–53].

According to the findings of numerous research, the patient-physician connection has a good impact on the patient's shared decision-making and adherence to treatment. Additionally, the patient's adherence to therapy is positively impacted by joint decision-making. Shared decision-making enhanced the impact of the patient-physician relationship on treatment compliance [54].

8. Discussion

Polycystic ovary syndrome (PCOS) is a multifactorial endocrine disorder with complex pathophysiology, in which insulin resistance (IR) plays a key role in both metabolic and reproductive dysfunctions. Treating IR is essential to control PCOS because it increases the risk of type 2 diabetes, cardiovascular disease, hyperandrogenism, and ovulatory dysfunction [4–7, 20, 34].

The increasing prevalence of PCOS and the widespread consumption of artificial sweeteners as sugar substitutes raise critical questions about the metabolic safety of these compounds in women with PCOS. This literature review explored the current evidence regarding the impact of AS on insulin resistance and metabolic health in this population.

Artificial sweeteners, once introduced as a healthier alternative to sugar and widely used in weight management, are increasingly under scrutiny for their metabolic effects. Although structurally diverse, AS share the ability to activate sweet-taste receptors and influence metabolic responses. Importantly, not all sweeteners exhibit the same effects. For example, saccharin has been shown to trigger cephalic-phase insulin release, while others such as sucralose and acesulfame K can alter insulin secretion at high doses via pancreatic taste receptor activation. However, these effects are often dose-dependent and more pronounced in animal models than in human trials, where typical consumption levels are lower [28].

A critical concern is the potential of AS to disrupt gut microbiota — a key regulator of metabolic homeostasis. Several studies have shown that non-nutritive sweeteners can induce dysbiosis, characterized by reduced diversity and abundance of beneficial bacteria such as Bifidobacterium and Lactobacillus. These microbiota shifts may promote low-grade inflammation and impair glucose tolerance, both of which exacerbate insulin resistance. Notably, some sweeteners such as erythritol and sorbitol appear metabolically inert in this regard, suggesting the need to assess each AS compound individually rather than as a homogenous group. The evidence highlights a concerning possibility: while AS are consumed with the intention to reduce caloric intake and support metabolic health, in some individuals — particularly those already metabolically vulnerable, such as women with PCOS — they may instead aggravate insulin resistance and related symptoms [11, 27, 30–32].

Women with PCOS often struggle with weight gain, abdominal obesity, and increased visceral fat, further compounding insulin resistance and hormonal imbalance. The gut–brain–endocrine axis is especially sensitive to dietary components, and AS may modulate gut hormone release, motility, and insulin sensitivity. While some of these hormones are targeted in diabetes treatment, artificial modulation via AS may lead to dysregulated responses. Human trials have not consistently confirmed these effects, and the exact clinical implications remain unclear [9, 11, 27–29, 55].

Importantly, the review emphasizes the necessity of distinguishing between different types of AS in both research and dietary guidelines. As shown, certain compounds may increase insulin secretion or interfere with gut microbiota, while others may be neutral or even beneficial when used appropriately. For women with

PCOS — a group already prone to metabolic syndrome — the risk–benefit profile of AS should be approached with caution [12, 26, 28].

From a treatment perspective, current PCOS management includes both pharmacological and non-pharmacological strategies, aiming to improve IR and alleviate symptoms. Pharmacological interventions such as metformin, thiazolidinediones, and inositol derivatives are commonly used to enhance insulin sensitivity, though they come with potential side effects. Non-pharmacological interventions (NPIs) — including lifestyle modifications, dietary changes, and supplementation — have shown significant promise in improving IR and reducing hyperandrogenic symptoms. A 2025 meta-analysis demonstrated that NPIs can reduce serum testosterone levels and improve clinical symptoms, including hirsutism, via hormonal modulation. Additionally, gut-focused therapies such as probiotics or increased dietary fiber may indirectly support hormonal balance by improving microbiota diversity [35, 37–39, 41–47].

The popularity of AS is often tied to weight management and calorie restriction, especially in populations attempting to improve their metabolic status. However, the evidence suggests that the role of AS in weight control is not clearly defined. Some randomized trials show modest benefits in weight loss, while observational studies have linked long-term AS consumption with increased BMI and abdominal obesity — possibly due to compensatory eating behaviours or microbiota-related mechanism [27].

Given the psychological burden and reduced quality of life associated with PCOS, including high rates of depression and body dissatisfaction, many women seek help in "healthier" dietary options such as AS which oppositelty to their intention may worsen insulin resistance and symptoms of PCOS. The strong bidirectional link between metabolic and reproductive health in PCOS necessitates cautious dietary planning, ideally under the supervision of healthcare professionals [21, 22].

9. Conclusions

Given the central role of insulin resistance in the pathophysiology of PCOS, the use of artificial sweeteners should be approached with caution. Although intended to reduce caloric intake and support weight management, growing evidence suggests that some AS may negatively impact gut microbiota, glucose metabolism and insulin sensitivity. These effects are especially concerning in metabolically vulnerable populations such as women with PCOS. Further high-quality human studies are needed to clarify the individual metabolic profiles of specific AS compounds. Until then, personalized dietary guidance remains essential in the management of PCOS.

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