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Nutrition and Lifestyle Intervention in a Patient with Polycystic Ovary Syndrome, Obesity, and Dyslipidaemia: A Case Report

Intervensi Nutrisi dan Gaya Hidup bagi Pesakit Menghidap Sindrom Ovari Polikistik, Obesiti, dan Dislipidemia : Sebuah Laporan Kes

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ABSTRACT

This case report presents a 30-year-old Malay woman with Polycystic Ovary Syndrome (PCOS) and obesity (BMI 33.5 kg/m²), referred for dietary management after inconsistent weight outcomes. The patient reported a sedentary lifestyle, emotional distress following her father's passing, and poor dietary habits, including intake of high saturated fats and refined sugars. Biochemical test findings revealed elevated triglycerides, LDL, and total cholesterol levels. A targeted intervention focusing on a calorie-restricted diet (1200–1500 kcal/day), reduction of fat and sugar intake, and increased fibre was implemented alongside gradual physical activity. Follow-up indicated initial improvements, including healthier food choices and moderate physical activity, though adherence challenges persisted. This case highlights the critical role of a multidisciplinary approach in addressing PCOS-related metabolic risks through lifestyle changes, patient-centred support, and regular follow-ups to ensure sustainable health improvements and prevent complications like type 2 diabetes and cardiovascular disease.

Keywords: diet, lifestyle, obesity, PCOS

ABSTRAK

Laporan kes ini membentangkan seorang wanita Melayu berusia 30 tahun dengan Sindrom Ovari Polikistik (PCOS) dan obesiti (BMI 33.5 kg/m²) yang dirujuk untuk pengurusan diet selepas keputusan penurunan berat badan yang tidak konsisten. Pesakit mempunyai gaya hidup sedentari, tekanan emosi selepas kehilangan bapa serta tabiat pemakanan tidak seimbang termasuk pengambilan tinggi lemak tepu dan gula ringkas. Ujian biokimia menunjukkan trigliserida, LDL dan kolesterol total melebihi paras normal. Intervensi pemakanan yang dilaksanakan melibatkan diet terhad kalori (1200–1500 kcal/hari), pengurangan lemak dan gula serta peningkatan pengambilan serat, disertai penambahan aktiviti fizikal secara beransur-ansur. Pemantauan susulan menunjukkan penambahbaikan awal dari segi pilihan makanan lebih sihat dan aktiviti fizikal sederhana, walaupun cabaran terhadap pematuhan diet masih wujud. Kes ini menekankan kepentingan pendekatan multidisiplin dalam menangani risiko metabolik berkaitan PCOS, termasuk penglibatan intervensi pemakanan, aktiviti fizikal, sokongan psikososial dan pemantauan berkala untuk memastikan hasil kesihatan berterusan. Strategi ini juga berpotensi mencegah komplikasi jangka panjang seperti diabetes jenis 2 dan penyakit kardiovaskular.

Kata Kunci: diet, gaya hidup, obesiti, PCOS

INTRODUCTION

Polycystic ovary syndrome (PCOS) is a multifactorial and polygenic endocrine disorder, affecting approximately 15% to 18% of women of reproductive age globally (Fauser et al. 2012). This complex condition is closely associated with hormonal imbalances, insulin resistance, and chronic low-grade inflammation, all of which contribute to a range of metabolic complications. Obesity, particularly visceral adiposity, can worsen

the clinical manifestations of PCOS by worsening insulin sensitivity and amplifying the risk of dyslipidaemia, type 2 diabetes, and cardiovascular diseases. The interplay of these conditions represents a significant public health challenge due to their high prevalence and intricate management requirements.

Insulin resistance plays a central role in the metabolic dysfunctions associated with PCOS, including hypertension, dysglycemia, and dyslipidaemia (Di Meo et al. 2017). Insulin resistance refers to the reduced biological response of target tissues to insulin stimulation. While any tissue with insulin receptors can develop insulin resistance, the liver, skeletal muscle, and adipose tissue are the primary contributors. This condition hampers glucose disposal, leading to a compensatory increase in insulin production by beta cells and resulting in hyperinsulinemia (Nolan et al. 2019). Excess body fat, particularly in the abdominal region, significantly influences the progression of PCOS by worsening insulin resistance.

Although insulin resistance is a common feature in women with PCOS regardless of body weight, obesity amplifies its adverse effects (Tosi et al. 2017). The increase in fat mass, particularly visceral fat, intensifies insulin resistance as adipose tissue is not merely an energy storage site but an active endocrine organ, producing peptide hormones like resistin and leptin, as well as inflammatory cytokines such as interleukin-1 beta (IL-1β) and tumour necrosis factor-alpha (TNF-α) (Makki et al. 2013). Dysfunctional adipocytes in visceral fat further contribute to inflammation and metabolic dysregulation, creating a vicious cycle that worsens the clinical presentation of PCOS. This mechanism not only heightens the risk of type 2 diabetes but also increases the likelihood of pancreatic β-cell dysfunction (Moran et al. 2010). Consequently, women with both PCOS and obesity face a heightened risk of developing metabolic syndrome, characterized by dyslipidaemia, hypertension, and impaired glucose tolerance. The management of PCOS and its associated risks requires a multifaceted approach targeting weight reduction, improvement in insulin sensitivity, and hormonal balance. Lifestyle interventions, including a calorie-controlled diet, regular physical activity, and behavioural modifications, are the key to achieving these goals. Addressing excess adiposity through sustained lifestyle changes can significantly improve insulin sensitivity and alleviate metabolic complications. Early and comprehensive management is crucial for preventing the progression of associated conditions such as type 2 diabetes and cardiovascular disease, thereby improving the long-term health outcomes of individuals with PCOS.

CASE PRESENTATION

CLIENT HISTORY

Patient is a 30 years old, Malay lady, referred to dietitian for obesity management with underlying polycystic ovary syndrome (PCOS). This is her 4th visit to the outpatient clinic with no changes in her dietary and health status. Patient is single and currently living with her mother. She works in an office from 8 am to 5 pm. She is not involved in any other activities outside of work, admitted to practicing a sedentary lifestyle and mostly spends her time at home. The patient's participation in health-promoting activities diminished, which is indicative of adjustment difficulties following bereavement.

ANTHROPOMETRY DATA

The patient's anthropometric measurements were obtained using OMRON HBF-375 body composition monitor and stadiometer. Patient's height was 1.55 meters, and her weight was 85.4 kg. Since her last visit four months ago, she has gained 3.2 kg. Her BMI is 33.5 kg/m², classified as Obese Class 2 based on the Malaysia Management of Obesity Clinical Practice Guidelines (2023). The trends in her weight, body fat percentage, and visceral fat levels during her visits are detailed in Table 1.

The patient initially demonstrated improvements during her second visit but later experienced weight gain and an increase in body fat and visceral fat levels, surpassing her initial recorded data. The body fat percentages exceeded the targeted body fat percentage of 20%-30% in women (Abernathy et al. 1996) and while visceral fat too exceeded the targeted rate of below 10 based on the reference range provided by Omron Healthcare. Upon assessment, the patient reported that her weight loss in May 2024 might be due to a prolonged fever and the subsequent weight gain might be related to stress after her father's passing 4 months ago.

BIOCHEMICAL DATA

Biochemical data was recorded on 17/12/2024 where the patient was tested on fasting serum lipid and HbA1c. The results are as in Table 2. The results indicate dyslipidaemia, with elevated triglycerides, LDL, and total cholesterol levels while the HbA1c level is still in the normal range.

TABLE 1: Anthropometry measurements of the patient

Variable	23/2/2024	10/5/2024	16/8/2024	27/12/2024
Weight (kg)	84.0	79.8 (- 4.2)	82.2 (+ 2.4)	85.4 (+ 3.2)
Body Fat (%)	40.5	39.3 (- 1.2)	39.8 (+ 0.5)	40.9 (+1.1)
Visceral Fat (rate)	17	14.5 (- 2.5)	16 (+ 1.5)	17.5 (+ 1.5)

TABLE 2: Biochemical data of the patient

Test	Baseline	Target	Deviation (%)
Triglyceride (mmol/l)	1.86 (+)	<1.7	+9.1
LDL (mmol/l)	5.84 (+)	<3.80	+53.7
NHDL (mmol/l)	6.69	-	-
HDL (mmol/l)	1.32	>1	-
Total Cholesterol (mmol/l)	8.01 (+)	<5.2	+54.0
HbA1c (%)	5.5	<6.5	-

The results were compared to the reference range set by the hospital. These abnormalities suggest poor dietary management, possibly exacerbated by physiological factors associated with PCOS. As this was her first blood test, no comparisons were made with previous biochemical data. She is not prescribed with any medication for cholesterol management.

NUTRITION-FOCUSED PHYSICAL FINDINGS

The patient reported experiencing intermenstrual bleeding, a symptom she has observed intermittently since 2019. However, she noted that her menstrual cycles have been regular over the past year, which may indicate stabilization of hormonal fluctuations. Despite this, her sedentary lifestyle remains a significant concern, as she spends most of her time at home outside of working hours. Recently, she has also begun experiencing back pain, which started approximately one week ago and may further impede her physical activity levels.

DIET HISTORY

The patient’s dietary intake reveals a pattern of high-calorie meals with limited nutritional diversity and frequent consumption of processed or high-fat foods. Nutritional assessment was conducted using Nutritionist Pro™ software to evaluate the patient's dietary patterns and intake composition. Diet history is taken using diet recall method by interviewing the patient. The analysis revealed a mean daily energy intake of 1,978 kcal, with macronutrient distribution comprising 91 g protein (18% of total energy), 180 g carbohydrates (36% of total energy), and 90 g fat (41% of total energy). The proportion of calories derived from fat substantially exceeded current dietary guidelines, which recommend 20-35% of total energy from fat sources.

Micronutrient and fibre analysis demonstrated significant deficiencies. Daily fiber intake ranged between 4-5 g, representing a marked deficit compared to recommended intake levels of 20-30 g/day. Added sugar consumption exhibited temporal variation, averaging 30 g/day on weekdays compared to 2-3 g/day on weekends. Sodium intake consistently exceeded 1,900 mg/day, contributing to the patient's overall cardiovascular risk profile.

Morning meal composition typically included two slices of bread with jam and butter, accompanied by a chocolate-flavored beverage mix, providing approximately 516 kcal while contributing 30 g of added sugars with negligible protein or fibre content. The midday meal, consisting of rice served with fried chicken and coconut-based curry preparations, represented the primary source of sodium intake (>350 mg per serving) while maintaining high energy density. Mid-afternoon snacking patterns included cream biscuits contributing approximately 133 kcal and 22 g of refined carbohydrates, further elevating simple sugar consumption. Evening meals, typically comprising fried rice noodles with half a portion of *nasi ambang* (a traditional mixed rice dish consisting of rice, fried fish, noodles, coconut-based condiments, and salted fish), added approximately 540 kcal with 23 g fat content and minimal fibre contribution.

Weekend dietary patterns demonstrated similar compositional characteristics, with breakfast alternatives such as pancakes and sambal anchovies maintaining elevated fat content (15 g) and moderate

sugar levels (2-3 g) while providing minimal fiber (<3 g per serving). Additional food choices including processed chicken nuggets, instant noodle, and coffee beverages containing sweetened condensed milk further increased saturated fat and added sugar intake.

The comprehensive dietary analysis indicates a pattern characterized by excessive energy density, elevated fat content (particularly saturated fats), predominance of refined carbohydrates, excessive sodium and added sugar consumption, with concurrent severe deficiency in dietary fibre, fresh fruit, and vegetable intake. This nutritional profile demonstrates significant alignment with the patient's clinical presentation of dyslipidemia and polycystic ovary syndrome-associated metabolic dysfunction, suggesting dietary modification as a critical therapeutic intervention target.

The patient's overall dietary habits are characterized by a reliance on energy-dense and highly processed foods, with limited consumption of whole foods, particularly vegetables and fruits. Protein sources are primarily from fried or processed options, and her meals are low in fibre and high in added sugars and fats. She rarely consumes dairy or fortified alternatives, as indicated by her intake of chocolate milk only twice a month. This dietary pattern, combined with a lack of regular physical activity (step count <5000 steps per day), contributes to her current weight status and metabolic imbalances, which include dyslipidaemia and PCOS-associated challenges.

NUTRITION DIAGNOSIS

Excessive energy intake related to limited adjustment to lifestyle changes as evidenced by current dietary intake of 1800-2000 kcal/day exceeding the requirement of 1200-1500 kcal/day.

NUTRITION INTERVENTION

The primary focus of this nutrition intervention was to create a sustainable dietary plan that supports healthy weight loss while addressing the patient's dyslipidaemia and underlying PCOS. The goals for this dietary intervention were to promote a healthy weight loss of 2-4kg in a month (Malaysia Management of Obesity Clinical Practice Guidelines, 2023) and to improve triglyceride, LDL and total cholesterol levels. Based on the same guideline, a diet consists of 1200-1500 kcal/day and 30% of fat allowance daily was prescribed to the patient. This allows up to 800 kcal calorie deficit daily to aid weight loss.

One key aspect of this intervention was reducing sugar intake, which can be essential for both weight management and improving her blood lipid profile. The patient was advised to discontinue the consumption of 3-in-1 drinks, because of their high added sugars content and unnecessary calories. A healthier alternative was prescribed such as low-fat chocolate milk, which provides protein and essential nutrients with low added sugars. Similarly, her afternoon snack of cream biscuits was replaced with plain crackers that were lower in fat and sugar.

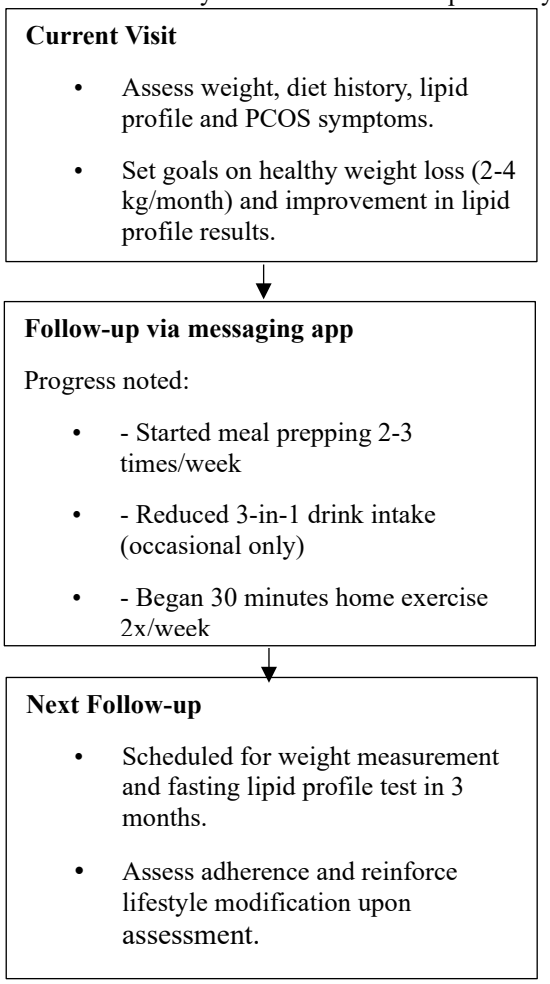
Another major dietary adjustment involved increasing her fibre intake, which will not only support satiety and weight loss but also help regulate blood sugar levels and improve lipid metabolism. The patient was recommended to include at least one cup of non-starchy vegetables during lunch and dinner. Vegetables such as spinach, broccoli, tomatoes, and cucumbers can be incorporated into meals as salads, stir-fries, or lightly steamed sides, offering a low-calorie, nutrient-dense addition to the diet. In line with the goal of following a low-fat diet, the type of fat consumed was emphasized. The patient was encouraged to reduce intake of saturated and trans fats commonly found in fried foods, creamy gravies, and processed snacks. Instead, she was recommended healthier fats from sources such as fish, nuts, seeds, and small amounts of olive or canola oil. The patient was recommended to alternate cooking methods such as grilling, steaming, baking, or air-frying instead of deep-frying most of her meals to consume lower fats.

Physical activity is another vital component of this intervention. The patient was advised to gradually increase her physical activity levels to meet the recommended 150 minutes of moderate-intensity exercise per week. Activities such as brisk walking, cycling, or simple home exercises can be incorporated into her routine to promote weight loss, improve cardiovascular health, and enhance overall well-being. By addressing these dietary and lifestyle factors comprehensively, the patient can achieve gradual weight loss, improve her lipid profile, and better manage the symptoms associated with PCOS. Compliance with the intervention plan, combined with regular follow-ups and support can help in achieving our goals.

OUTCOME AND FOLLOW-UP

A follow-up evaluation was conducted one-month post-intervention via digital communication. The patient reported implementing dietary and lifestyle modifications with varying degrees of adherence. She began meal preparation, bringing home-prepared meals to work 2-3 times weekly, including grilled chicken sandwiches and fried rice with chicken breast and vegetables prepared with controlled oil amounts. On days without meal preparation, she continued consuming energy-dense workplace food options due to limited healthier alternatives.

FIGURE 1: Summary of Visit and Follow-up Activity



Consumption of 3-in-1 beverage mixes was reduced to occasional intake, primarily on days when breakfast was skipped, representing progress in sugar reduction. The patient also initiated home-based exercise, performing 30-minute sessions twice weekly (total: 60 minutes/week). While this falls below the recommended 150 minutes of moderate-intensity weekly activity, it represents initial progress toward increased physical activity. Weight measurement was not obtained due to lack of home weighing equipment. A comprehensive three-month follow-up appointment was scheduled to assess weight changes and repeat fasting lipid profile evaluation. The patient demonstrated partial adherence to lifestyle interventions with gradual dietary improvements and initiation of regular exercise, indicating that continued monitoring and support are warranted to optimize therapeutic outcomes.

DISCUSSION

The patient's current eating patterns, featuring a high intake of saturated fats and refined sugars combined with inadequate fibre consumption, are contributing to the aggravation of her metabolic issues. These dietary patterns are strongly associated with adverse health outcomes in women with PCOS. A 2017 study analysing the diets of 54 women with PCOS demonstrated that poor dietary habits contribute to metabolic disorders, potentially impairing ovarian function (Szczuko et al. 2017). This is evident in this case, as the patient's fasting serum lipid profile reveals significant abnormalities, including elevated triglycerides, LDL cholesterol, and total cholesterol, indicative of dyslipidaemia. To address these concerns, the patient was prescribed a dietary plan consisting of 1200-1500 kcal per day with 30% of daily caloric intake derived from fat. This prescription aligns with the PCOS management guidelines, which emphasize the importance of promoting healthy lifestyle behaviours in all women with PCOS to achieve or maintain a healthy weight and improve overall health outcomes (Teede et al. 2023). For individuals with excess weight, the guidelines recommend a weight loss target of 5-10%, achieved through an energy deficit of 500-750 kcal per day, which corresponds to the prescribed caloric range.

Findings from multiple studies highlight the significant role of dietary interventions, particularly low-calorie diets, in managing PCOS. Diets such as the Mediterranean and DASH diets, rich in fibre and essential nutrients, further contribute to metabolic and hormonal balance. Research consistently demonstrates that caloric restriction improves insulin sensitivity, reduces hyperandrogenism, and aids in weight loss, all of which are crucial for alleviating PCOS symptoms (Xenou et al. 2021). A study in 2020 by Kazemi et al. found that Mediterranean and DASH diets, rich in fibre, antioxidants, and healthy fats results in improved ovarian morphology, reduced insulin resistance, and regulated follicular development (Kazemi et al. 2020). Furthermore, another case-control study in Italy found that women with PCOS who adhered to a Mediterranean diet exhibited improved insulin resistance and reduced inflammation (Barrea et al. 2019). Similarly, a study in 2015 by Phy et al. reported that a low-starch, dairy-restricted diet led to weight loss, improved insulin sensitivity, and reduced androgen levels, while Shishehgar et al. (2019) showed that hypocaloric diets enhanced menstrual regularity and lowered hyperandrogenaemia (Phy et al. 2015; Shishehgar et al. 2019). These findings highlight the importance of personalized nutritional strategies as a fundamental component of PCOS management.

Physical activity is another crucial component of the management strategy. The guidelines suggest a minimum of 150 minutes per week of moderate-intensity exercise or 75 minutes per week of vigorous-intensity exercise to prevent weight gain. For effective weight loss and prevention of weight regain, this recommendation increases to 250 minutes per week of moderate-intensity exercise or 150 minutes per week of vigorous-intensity exercise (Teede et al. 2023). Incorporating these exercise recommendations, along with dietary and behavioural modifications, forms the cornerstone of lifestyle intervention in PCOS management. The effectiveness of such interventions was supported by evidence from a Cochrane review of 15 randomized controlled trials (RCTs) involving 498 participants. This review found that lifestyle interventions, compared to minimal intervention or usual care, led to significant reductions in weight and body mass index (BMI) (Lim et al. 2019). Furthermore, these interventions also improved metabolic parameters, including reductions in total cholesterol, low-density lipoprotein cholesterol (LDL-C), and fasting insulin. Such metabolic improvements are particularly important for this patient, given her dyslipidaemia and elevated visceral fat levels.

In addition to weight and metabolic benefits, dietary modifications targeting macronutrient quality and balance can also play a role in alleviating PCOS symptoms. For instance, increasing dietary fibre intake and reducing refined sugar consumption may improve insulin sensitivity, regulate blood glucose levels, and support lipid metabolism. Based on a study, the impact of soluble dietary fibre on short-chain fatty acids can be seen where fermentable fibre provides significant metabolic benefits by positively influencing the gut microbiome, leading to the production and release of short-chain fatty acids (Barber et al. 2020). Likewise, shifting fat intake from saturated and trans fats to unsaturated fats, sourced from fish, nuts, seeds, and plant oils, can positively influence cardiovascular risk factors. Behavioural strategies, such as goal setting, self-monitoring, and regular follow-ups, are integral to ensuring adherence to dietary and physical activity recommendations.

A key limitation of this case report is the absence of standardized psychosocial assessment tools during the patient's visits. Although the patient reported emotional distress following bereavement, instruments such as the PHQ-9 for depression or quality of life questionnaires were not administered at the time of assessment. As a result, the psychological impact on dietary adherence and motivation could not be objectively quantified. Future cases would benefit from incorporating validated mental health screening tools alongside dietary and lifestyle evaluations to provide a more comprehensive understanding of patient progress and barriers to adherence. The interplay between dietary changes, physical activity, and behavioural interventions not only addresses the immediate weight and metabolic concerns but also reduces the risk of associated conditions such as type 2 diabetes and cardiovascular disease. For this patient, a comprehensive approach that includes regular monitoring, personalized support, and gradual progression toward these lifestyle targets is essential for sustainable improvement in her health outcomes.

CONCLUSION

In summary, obesity intensifies the metabolic and hormonal disturbances associated with Polycystic Ovary Syndrome (PCOS), through its impact on insulin resistance and the development of comorbidities such as dyslipidaemia, type 2 diabetes, and cardiovascular disease. Effective management therefore requires a comprehensive, multifaceted approach that prioritizes weight reduction and improvements in insulin sensitivity. Sustainable lifestyle interventions, including a calorie-controlled, nutrient-dense diet coupled with regular physical activity, remain the foundation of PCOS care. Evidence indicates that even a modest 5–10% reduction in body weight can yield substantial benefits in insulin sensitivity, lipid regulation, and hormonal balance, thereby reducing long-term metabolic risks. Addressing dietary quality by limiting saturated fats, refined sugars, and processed foods, while promoting fibre-rich foods,

lean proteins, and healthy fats, is central to improving metabolic outcomes. Ultimately, early diagnosis combined with continuous, patient-centred management can help prevent disease progression, enhance metabolic health, and improve the overall quality of life for women living with PCOS.

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