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Nutrition Needs Assessment for Women of Childbearing Age with Polycystic Ovarian Syndrome

A thesis

presented to

the faculty of the Department of Rehabilitative Sciences

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by

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Symptom Management

ABSTRACT

Nutrition Needs Assessment for Women of Childbearing Age with Polycystic Ovarian Syndrome

by

Callie G. Coleman

Polycystic Ovarian Syndrome (PCOS) is an endocrine disorder that affects women's menstrual cycles, androgen (male hormones) levels, and cysts on the ovaries. This endocrine disorder has various symptoms, with insulin resistance as a hallmark symptom. Approximately 65-70% of women with PCOS have insulin resistance and hyperinsulinemia, whether or not they are overweight, obese, or lean (Marshall & Dunaif, 2012). Many women with PCOS struggle to lose weight because their excess weight is related to nutrition, lifestyle factors, and imbalanced hormones. Understanding PCOS as a metabolic disorder with nutritional implications led to investigating the potential benefit of having registered dietitian nutritionists (RDN) as part of the healthcare team of women with PCOS. We developed a survey based on the literature on PCOS, diet/nutrition interventions, and the role of RDNs in the healthcare team of PCOS women of childbearing age. Only childbearing-age women (18–44) diagnosed with PCOS were eligible to complete the survey. The survey was designed as a needs assessment to determine if women with PCOS are routinely referred to RDNs for support; whether or not such support is beneficial; and what gaps in knowledge or misconceptions about nutrition and PCOS exist among participants. Most importantly, it was designed to examine if women understand how nutrition relates to managing their PCOS symptoms and future disease risks. The data from this survey shows the need for RDNs on the healthcare team of women with PCOS and gives us an understanding of nutrition education interventions that could be developed for future studies. Understanding how

RDNs play a role in symptom management could lead to a better quality of life for women with PCOS.

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TABLE OF CONTENTS

ABSTRACT	2
LIST OF TABLES	6
LIST OF FIGURES	7
Chapter 1. Introduction	8
Polycystic Ovarian Syndrome Overview	8
Prevalence of PCOS.....	11
Chapter 2. Literature Review	13
Diet and PCOS.....	15
Surveys/Questionnaires on Lifestyle and Nutrition Habits	17
Mediterranean Diet and PCOS.....	19
Chapter 3. Methods	25
Chapter 4. Results and Discussion.....	28
Chapter 5. Conclusion and Recommendations	35
References.....	39
APPENDICES	45
Appendix A: Consent Form/ Survey.....	45
VITA.....	52

LIST OF TABLES

Table 1. Different Criteria Used for PCOS Diagnosis.....	8
Table 2. Demographic Questions.....	36

LIST OF FIGURES

Figure 1. Diagnosis Provider 33

Figure 2. Symptoms Upon Diagnosis 38

Figure 3. Referral to RDN..... 39

Figure 4. Interest in Nutrition Education 39

Chapter 1. Introduction

The cross-sectional study surveyed women of childbearing age diagnosed with PCOS. This study aimed to determine whether or not women diagnosed with PCOS understand how diet relates to their symptoms/symptom management and if they would be better supported if they had a consult with a registered dietitian nutritionist (RDN). There was an additional objective to learn if women have tried specific diets or nutrition plans from an RDN or on their own. If they have not consulted with an RDN, is there a knowledge deficit in women with PCOS of childbearing age-related to nutrition and how it affects their symptom management, and would a referral to an RDN benefit them? The hypothesis was, "If a woman who has been diagnosed with PCOS, of childbearing age, were referred to an RDN and given a nutrition intervention, then she would have better management of symptoms." Ultimately, this research study was a nutritional needs assessment on the population of childbearing women with PCOS diagnoses.

Polycystic Ovarian Syndrome Overview

Polycystic Ovarian Syndrome (PCOS) is an endocrine disorder that affects women's menstrual cycles and their androgen (male hormones) levels. Most practitioners use the Rotterdam Criteria, established in 2003, to diagnose PCOS. It is in the guidelines of the Endocrine Society for diagnosis of PCOS because the diagnosis criteria help to rule out other endocrine and ovulatory disorders. To be diagnosed by the Rotterdam Criteria, a woman must have at least two findings: hyperandrogenism, polycystic ovaries, or ovulatory dysfunction (not ovulating/amenorrhea) (Williams, 2016). Other diagnostic standards include the National Institutes of Health criteria (1990), which specify two criteria only (hyperandrogenism and oligomenorrhea), and the Androgen Excess and PCOS Society (2009), which specified two pairs of criteria (hyperandrogenism and oligomenorrhea or hyperandrogenism and polycystic ovaries)

(Williams, 2016). These three different criteria are shown in Table 1 (Williams, 2016). Each set of diagnostic criteria considers the three key symptoms of PCOS - the high levels of androgens in the body, lack of an ovulating/lack of irregular menstrual cycle, and cysts on the ovaries.

A variety of symptoms are associated with this endocrine disorder, with insulin resistance being one of the most common symptoms and therefore leading PCOS to be considered a “metabolic disorder.” Approximately 65-70% of women with PCOS have insulin resistance and hyperinsulinemia, whether or not the women are overweight, obese, or lean (Marshall & Dunaif, 2012). Some women with PCOS who are not overweight, obese, or classified as diabetic still have delayed insulin action. However, out of the 65-70% of women who are insulin resistant, 70-80% of these women are obese, classified by a BMI of over 30 (Marshall & Dunaif, 2012). Many women with PCOS struggle to lose weight because their excess weight is tied to their lifestyle and imbalanced hormones due to increased male hormones. In addition, most of their weight gain and adipose tissue is around the abdomen. Another common symptom of PCOS is hirsutism (hair growth on the face, chest, back, or stomach), or male-pattern baldness/thinning hair, both caused by hyperandrogenism. Hormonal acne and oily skin are also caused by hyperandrogenism and are common in many women with PCOS. Depression and anxiety are common among this population, possibly related to fluctuating hormones, and when women have what seems like uncontrollable symptoms, it can be discouraging.

There is a variety of current PCOS treatments and interventions. Many interventions are based on when the woman is diagnosed and whether she wants to become pregnant. For many women who are not trying to conceive, one of the first recommendations by OBGYNs is to put their patients on birth control for the imbalanced hormones that PCOS women are experiencing. Hormonal contraceptives are common for women experiencing hormonal acne and irregular

periods (Williams, 2016). For infertility, clomiphene and letrozole are often prescribed (Williams, 2016). Metformin is commonly prescribed to women with PCOS, as it is an oral medication for hyperglycemia, also prescribed for people with type 2 diabetes. Lifestyle modifications for weight management have been recommended to women who are overweight or obese, often without the guidance of an RDN. Low-carbohydrate diets and other similar recommendations have been studied and recommended to women with PCOS as a way for them to lose weight. However, the current recommendation for women with PCOS from the Academy of Nutrition and Dietetics Nutrition Care Manual should be based on three cornerstones to weight loss: a reduced calorie diet (caloric deficit), behavior changes, and increasing physical activity (Nutrition Care Manual, 2023). Nutrition and diet are vital components of helping women with symptom management of PCOS. Weight loss is correlated with reduced serum testosterone concentration and the resumption of ovulation, leading to women being able to conceive a child (Moran et al., 2003). Also, lifestyle treatment and learning about what foods affect body functions can help manage and reduce insulin resistance in not only PCOS but other metabolic disorders. Indeed, nutrition habits and PCOS symptom management are related.

Prevalence of PCOS

The endocrine disorder, PCOS, is one of the most prevalent causes of infertility. The prevalence of polycystic ovarian syndrome worldwide is estimated at 4-20% of women (Deswal, 2020). In the last decade, the number of women with existing or newly diagnosed PCOS has increased (Deswal, 2020). The PCOS Awareness Association states that about 10 million women worldwide suffer from this chronic condition (Polycystic Ovary Syndrome Support Groups Are Helpful, n.d.-b). About 50% of women with PCOS go undiagnosed, and approximately 1 in 10 women are affected by PCOS (PCOS Challenge: The National Polycystic Ovary Syndrome

Association, 2018). The Endocrine Society stated that 7-10% of childbearing-age women in the United States have PCOS, translating into an estimated 5 to 6 million women. It is the most common hormonal disorder among women in this age group (Endocrine Society, 2022). These statistics are an indicator of why more research needs to be done on PCOS and how treatments can be more accessible and more efficient.

According to the PCOS Challenge, treatments and diagnosing women with PCOS are estimated to cost \$13.8 billion for the American healthcare system (PCOS Challenge: The National Polycystic Ovary Syndrome Association, 2018). This estimate is likely due to the prescribed medications and the diagnostic testing that women are subject to with PCOS or when suspected to have PCOS. It could also be due to increased health risks in women with PCOS. Women with PCOS are at an increased risk of cardiovascular disease, prediabetes and type 2 diabetes, hypertension, hyperlipidemia, metabolic syndrome, and obesity. As mentioned above, a significant number of women with PCOS also have insulin resistance. Insulin resistance leads to a significant risk of prediabetes and type 2 diabetes. In a study completed in 2020, *Effect of Diet on Insulin Resistance in Polycystic Ovary Syndrome*, researchers stated that 75% of lean women with PCOS and 95% of obese women with PCOS had insulin resistance (Shang et al., 2020). In an article focusing on novel management options for women with obesity and PCOS, researchers found that most (38 – 88%) of women with PCOS are overweight or obese (Barber et al., 2019). This finding shows how important it is to consider insulin resistance when examining and treating women with PCOS. This symptom is common and causes women to be at risk for later complications and diseases.

Table 1

Different Criteria used for diagnosis of PCOS

Table 1. Criteria for Diagnosis of PCOS

<i>Clinical finding</i>	<i>National Institutes of Health criteria, 1990 (must have both of the findings marked below)</i>	<i>Rotterdam criteria, 2003 (must have any two of the findings marked below)</i>	<i>Androgen Excess and PCOS Society, 2009 (must have A plus either B or C)</i>
Hyperandrogenism*	X	X	A
Oligomenorrhea	X	X	B
Polycystic ovaries		X	C

PCOS = polycystic ovary syndrome.
**—Clinical or biochemical evidence of excess androgen.*
Information from reference 19.

NOTE: From “Diagnosis and Treatment of Polycystic Ovarian Syndrome,” by T. Williams, R. Mortada, and S. Porter, 2016, *American Academy of Family Physicians*, 94(2), p. 106-113. (<https://www.aafp.org/pubs/afp/issues/2016/0715/p106.html>) Copyright © 2016 by the American Academy of Family Physicians.

Chapter 2. Literature Review

This literature review examines recent research to determine nutrition recommendations and effective nutrition-related interventions to help women manage symptoms of PCOS. A total of twenty-one articles were identified and chosen to review based on their criteria. The exclusion criteria were any articles written before the year 2000 and articles that did not discuss nutrition or diet in relation to PCOS. For inclusion criteria, the articles focused on women with PCOS of childbearing age, diet or nutrition in relation to PCOS symptoms, or, if there was no discussion of diet, included the use of RDNs to help the management of PCOS. The hormonal disorder being studied is PCOS, so only articles focused on this disorder were included, while articles focused on other hormonal or endocrine disorders were not reviewed.

Results of the review showed a correlation between diet and PCOS management and that if women with PCOS are overweight, weight loss is an important treatment goal. It is essential for women with PCOS who are overweight or obese to lose weight for their overall health and to decrease the risk of future diseases, like cardiovascular disease, hypertension, type 2 diabetes, hypercholesteremia, and metabolic syndrome. In most articles, there was an echo of including a low glycemic index diet in women with PCOS to help their insulin resistance, regardless of whether they were overweight. Additionally, recommendations included increasing omega-3 fatty acids and decreasing the amount of saturated fat consumed in the diet. Despite these recommendations, there is no single type of diet that is preferred for the treatment of PCOS. The critical evidence from the studies shows low-glycemic index diets and diets that are anti-inflammatory, higher in omega-3 fatty acids, or a Mediterranean-style diet could be used to shape the optimal diet in the treatment of women with PCOS. It has been proven that there is a need for nutrition and lifestyle management interventions for women with PCOS for the goal of

weight loss in those who are overweight or obese and for the reduction of disease risk and insulin resistance in lean and overweight patients. There is proof that nutrition interventions and medical treatment need to be provided. The studies that have surveyed women with PCOS about their diet and lifestyle habits show a need for education and proper dietary advice.

The significant gap in the literature is the evidence for RDNs to be included in the healthcare team of women with PCOS. From the searches, literature about the use and effectiveness of nutrition education and counseling provided by RDNs needed to be improved. However, the gap in the literature shows the need to study how patients with PCOS could benefit from being counseled by RDNs regularly as part of treatment versus the education they are receiving from their practitioners or non-dietetic sources. It is yet to be shown the long-term outcomes of those with PCOS receiving this type of education from an RDN versus trying to learn on their own and navigate what reliable health information is. Future research is needed to show how dietary advice from registered dietitians versus the other dietary advice that women with PCOS receive could change their symptom management, quality of life, and how well they adhere to the nutrition changes asked of them. There is no research on how meeting with an RDN upon diagnosis of PCOS versus the advice given by the practitioner diagnosing the patient with PCOS, nor how meeting with an RDN after an extended time since being diagnosed affects symptom management. There needs to be more research on where women with PCOS access dietary information, if they are not receiving it from an RDN, and if they are getting reliable information. In addition, from the literature on the need for RDNs on the healthcare team of PCOS patients, there are barriers like insurance reimbursement and the need for education so that other healthcare providers are willing to refer patients to RDNs for nutrition counseling for this endocrine disorder. More policies on covered insurance benefits

need to be made so that long-term nutrition education or even a consultation by an RDN can be more accessible to patients. There also needs to be policies implemented in the sphere of women's health related to such multifaceted endocrine disorders that require multiple healthcare team members to treat symptoms. These implications were found from a literature review and gave the framework for designing the needs assessment survey study.

Diet and PCOS

Some of the earliest studies examining the relationship between diet and treatment of PCOS date back to 2005-2006. For example, Douglas et al. (2006) sought to determine if a caloric diet (a diet in which participants eat about the same number of calories as they expend) high in monounsaturated fatty acids or low in carbohydrates would increase insulin sensitivity and decrease circulating insulin concentrations versus a standard diet in women with PCOS. They found that a caloric diet low in carbohydrates (43%) and cholesterol, high in fiber, and containing 45% of fat (18% monounsaturated fat and less than 8% saturated fat) improved the metabolic profile of women with PCOS in 16 days (Douglas et al., 2006). In a review study, Faghfoori et al. (2017) examined studies completed on nutritional management in women and showed the connections between different approaches. The overall conclusion from the review study was that weight loss was important for the improvement of insulin sensitivity, and a good diet included low saturated fat intake, average amounts of omega-3 fatty acids, and sufficient fiber intake with low glycemic index (GI) carbohydrate sources (Faghfoori et al., 2017). A similar narrative review investigated the different strategies and lifestyle changes researched for treatment in PCOS patients (Szczyko et al., 2021). The authors reviewed literature in the past 20 years focused on PCOS therapy unrelated to medical therapy. They concluded that the metabolic pathways that lead to abnormalities in PCOS women showed significant improvement

in these parameters depending on lifestyle factors that can be modified (Szczuko et al., 2021). These lifestyle modifications include normalization of sleep, introducing daily activity, and introducing a low-calorie diet with low GI (Szczuko et al., 2021). The authors also found that supplementation with antioxidants and certain herbs seemed effective in lowering or helping to balance out the chronic inflammation that PCOS women experience (Szczuko et al., 2021).

Another study by Moran et al. (2003) investigated the effects of a low or high-protein diet with caloric restriction on symptom improvement in PCOS. Women with overweight PCOS were randomized to a low or high-protein diet, which consisted of a twelve-week energy restriction followed by four weeks of weight maintenance (Moran et al., 2003). This study focused on how diet macronutrient composition affected patients' clinical parameters and improved reproductive function. It was confirmed in the study that weight loss had a positive effect on improving endocrine, metabolic, and clinical parameters in women who are overweight with PCOS (Moran et al., 2003). The higher protein diet that replaced protein for carbohydrates showed minor cardiovascular and reproductive improvements. However, the researchers concluded that weight loss should be the focus of treatment in overweight women with PCOS (Moran et al., 2003). The caloric deficit and minor weight loss can enhance reproductive function in women with PCOS, prevent pregnancy and birth complications, and reduce the risk of disease later in life.

Finally, Moran et al. (2011) reviewed six randomized control trials that compared lifestyle treatment to minimal or no treatment in PCOS women. Three reviewed studies compared physical activity to little or no dietary and behavioral advice. Three studies combined interventions with dietary, behavioral, and exercise advice or no advice given at all (Moran et al., 2011). The authors concluded that lifestyle interventions improved hyperandrogenism, insulin

resistance, and body composition in PCOS women (Moran et al., 2011). However, no evidence supports improved glucose tolerance or lipid profiles. No reviewed literature assessed the clinical reproductive outcomes, treatment satisfaction, or quality of life related to lifestyle interventions (Moran et al., 2011).

Surveys/Questionnaires on Lifestyle and Nutrition Habits

In the article, *Habitual dietary intake, eating pattern and physical activity of Women with polycystic ovary syndrome*, participants completed a 7-day estimated food and activity diary along with a questionnaire designed specifically for the study about PCOS self-reported symptoms, PCOS-related nutritional advice received, and weight (Barr et al., 2011). The research from this study showed that high sugar consumption was enough for concern because of the more frequent consumption of sweet snacks (Barr et al., 2011). The article noted that the glycemic index was average compared to UK women's general population. However, it was noted that usually, advice from registered dietitians focuses on reducing energy intake and dietary glycemic index (Barr et al., 2011). This quote is pulled directly from the article, "...although relatively few women with PCOS receive dietary advice from a registered dietitian, which may explain the problems with implementing this type of regime." (Barr et al., 2011) This quote is worth noting because it shows the lack of registered dietitians advising women. The conclusion of the article noted that even though many of the women with PCOS who answered this diary and questionnaire were not overweight, their dietary intake and eating patterns were found to not be best for the management of their symptoms and preventing or reducing the risk of future disease (Barr et al., 2011). It is essential to focus on lifestyle interventions that promote weight management with physical activity and dietary advice on carbohydrate modification,

quality and quantity of fat consumed, and the role of dietary glycemic index and glycemic load and eating patterns in women with PCOS (Barr et al., 2011).

The following article gave a questionnaire regarding women's lifestyle and food habits with PCOS; the pretested questionnaire contained 15 questions (Mariona et al., 2020). The 15 questions measured baseline food habits, physical activities, and sedentary lifestyles in women ages 20-25, and the questions were straightforward and self-analyzing so that the results could not be misinterpreted (Mariona et al., 2020). The study concluded that 75% of the women who answered (50 women) were busy professionals that did not have sufficient time to invest in their health, and this made them compromise on their eating habits (not taking in meals at proper intervals or having unhealthy food habits) (Mariona et al., 2020). The researchers concluded that 70% of them could improve their food habits and lead healthy lifestyles (Mariona et al., 2020). So, these articles showed the need for intervention and implementation of a diet intervention because women with PCOS do not have the lifestyle and nutrition habits that support their symptom management and prevent disease risk long-term.

Mediterranean Diet and PCOS

In the study, *Adherence to the Mediterranean Diet, Dietary Patterns and Body Composition in Women with Polycystic Ovary Syndrome (PCOS)*, they used a PREDIMED questionnaire (prevention with the Mediterranean diet) and seven-day food records were used to evaluate how well women with PCOS adhered to the MD and diet patterns (Barrea et al., 2019). The limitations of this article were their use of a "qualified nutritionist" to administer the questionnaire; it would have been more clinically appropriate to use a registered dietitian. Also, in this study, no evidence or record showed if PCOS women were given any nutrition advice before the MD adherence testing. Although, what they found from this study was a direct

association between adherence to MD and PCOS, and the data showed that there could be a therapeutic role for single foods and nutrients of the MD for PCOS inflammation, insulin resistance, and hyperandrogenemia (Barrea et al., 2019). Many women with PCOS reported low adherence to MD and high consumption of simple rather than complex carbohydrates (Barrea et al., 2019). Overall, this study helped determine that if women with PCOS can adhere to the diet, there is an association between the diet and PCOS symptoms.

The following study was a review, *Dietary Interventions: A Promising Treatment for Polycystic Ovary Syndrome*, a review of the different diets that impact insulin resistance and weight loss and improve reproductive function; the diets were reviewed because there has not been an optimal diet determined for PCOS women (Che et al., 2021). They reviewed the Mediterranean diet, the Ketogenic diet, the DASH diet, low-GI diets, and the pulse-based diet. When speaking of the Mediterranean diet, the article mentioned the benefits of the diet that are widely known. It has been shown to reduce the risk of insulin resistance-related diseases, like type 2 diabetes, cardiovascular disease, obesity, nonalcoholic fatty liver disease, cognitive impairment, breast cancer, and chronic kidney disease (Che et al., 2021). The diet overall was reviewed to be a diet that could be an excellent intervention for women with PCOS because of their symptoms and long-term health risks. However, many women with PCOS consume low amounts of Mediterranean diet foods, and adherence must be considered and promoted (Che et al., 2021). Getting many people to adhere to the diet is difficult if they are not in a Mediterranean region (Che et al., 2021). However, they mentioned that the Mediterranean Diet Foundation Expert Group had developed a MedDiet Pyramid and that this new graphic representation could help improve adherence (Che et al., 2021). The authors state, "...it should be recommended without any restrictions to promote health and well-being in women with PCOS." (Che et al.,

2021) The authors concluded that more research is warranted to determine the optimal dietary recommendations for women with PCOS (Che et al., 2021). Overall, the article gave the pros and cons of each diet and how it has been studied in PCOS women.

In the article, *Mediterranean Diet Combined with a Low-Carbohydrate Dietary Pattern in the Treatment of Overweight Polycystic Ovary Syndrome Patients*, in this study a twelve-week randomized control trial was conducted on PCOS women who were overweight and they were assigned to either follow a Mediterranean Diet/Low-Carb diet or a Low-Fat diet.

Both diets aimed to improve long-term metabolic and restrict the consumption of sweets and foods high in trans fat (Mei et al., 2022). Participants were provided a daily food recommendation every seven days through the Chinese software WeChat. During the diet intervention, they were instructed to record their daily food intake to ensure treatment adherence (Mei et al., 2022). At the end of each week, research staff contacted participants, and the program was reviewed and monitored for adverse events, along with providing counseling if needed (Mei et al., 2022). The most successful diet was the Med Diet in combination with the low carbohydrate diet over the low-fat diet intervention (Mei et al., 2022). The Med Diet/LC effectively modified reproductive endocrine levels, insulin resistance levels, lipid levels, and anthropometric parameters (Mei et al., 2022). Both diets provided recovery of menstrual cycles and were approximately the same in this measure (Mei et al., 2022). They concluded that this diet model could be a recommendation for overweight patients with PCOS (Mei et al., 2022).

The following study, *The Association of a Mediterranean-Style Diet Pattern with Polycystic Ovary Syndrome Status in a Community Cohort Study*, surveyed women of three different age cohorts. The surveys were given over time. The data collected was based on the five data collection surveys (the first was done in 1996, the next was in 2009). It was a food

frequency questionnaire, and Mediterranean-style dietary patterns independently corresponded with PCOS status (Moran et al., 2015). From the survey five data collection, there was an indication of improvement in the quality of dietary intake after being diagnosed with PCOS (Moran et al., 2015). Therefore, it was more likely that after being diagnosed with PCOS, women were more likely to eat a Mediterranean-based diet (Moran et al., 2015). The reasoning behind this relationship was inconclusive but might be due to the population of women surveyed being in Australia (Moran et al., 2015). Researchers noted that future research was needed to examine the contributions of dietary patterns to the severity of PCOS and how their dietary patterns could be modified in the lifestyle recommendations of PCOS women (Moran et al., 2015). This cohort study could show that as women are diagnosed with PCOS, they are more likely to eat a healthier diet in the hopes of weight loss or symptom management, but we need further research on a different population of women with PCOS.

The last study reviewed discussed the Mediterranean diet and PCOS (Salama et al., 2015). One hundred nonpregnant overweight or obese adult females diagnosed with PCOS by the Rotterdam Criteria enrolled in the study, and 75 completed the trial (Salama et al., 2015). The participants consumed an anti-inflammatory, lower-calorie diet and engaged in physical activity for twelve weeks (Salama et al., 2015). Then fasting blood samples, body fat percentage, visceral fat area, and anthropometric measurements were taken for baseline and at the end of the intervention (Salama et al., 2015). The Mediterranean Diet inspired the diet; it was a low glycemic load and anti-inflammatory diet based on a combination of nutrients (Salama et al., 2015). The diet reduced calories, lowered overall fat and saturated fat intake, included moderate to high amounts of fiber, encouraged consumption of low glycemic load and complex carbohydrates, and lowered sugar content (Salama et al., 2015). The meal plan incorporated

smaller, more frequent meals throughout the day, lowering the diet's glycemic load (Salama et al., 2015). When the study ended, the results showed moderate weight loss and significant improvement in body composition, glucose homeostasis, blood pressure, hormones, menstrual cyclicity, serum amyloid, C-reactive protein, and dyslipidemia (Salama et al., 2015). The rate of menstrual cyclicity achieved was 63% (Salama et al., 2015). This study did achieve clinically relevant weight loss in PCOS patients, and there was a significant improvement in labs related to PCOS (Salama et al., 2015). These outcomes showed that Mediterranean diet combinations can produce clinically relevant results.

PCOS and the Role of Dietitians in Treatment

In the article, *The Current Description and Future Need for Multidisciplinary PCOS Clinics*, a review of the literature on the limited research on the need for multidisciplinary teams were reviewed. The article noted limited evidence on the topic, even though it is widely known that PCOS is a multifaceted disorder. The authors noted that the benefits of the clinics and research completed on a multidisciplinary team for PCOS perceived improvement in weight loss, better body image, and better management of PCOS with holistic practices (Wolf et al., 2018). In addition, a study completed in the UK, *Dietary management of women with polycystic ovary syndrome in the United Kingdom: The role of dietitians*, gave a questionnaire to registered dietitians who worked in various areas/settings about how frequently they saw women with PCOS and what diet/lifestyle advice do they give to these women (Jeanes et al., 2009). They also gave a questionnaire to women with PCOS regarding diet and where they found nutrition information (Jeanes et al., 2009). These questionnaires found that registered dietitians see women with PCOS frequently and give them sound nutrition advice. However, women with PCOS recognized the importance of diet and lifestyle management. Their information usually

comes from non-dietetic resources, which could result in the inappropriate implementation of advice (Jeanes et al., 2009). The study concluded by stating there is a role for dietitians in optimizing the management of PCOS symptoms in this patient group (Jeanes et al., 2009). This article stated that there needed to be more intervention studies to research reduced GI diets on symptom control and lowering disease risk (Jeanes et al., 2009). Another article, *Future Implications of Using Registered Dietitians in Multidisciplinary Polycystic Ovary Syndrome Treatment*, investigated the need and trends for PCOS clinics that include dietitians. They surveyed practitioners and followed up with focus groups. They found from the study that some barriers to getting dietitians into clinics and being part of the healthcare team for PCOS patients were insurance reimbursement, money/resources, and differing opinions of care (Wolf, Wattick, Murray, et al., 2018). There was also the barrier of not all registered dietitians having the knowledge and training of care for PCOS patients (Wolf, Wattick, Murray, et al., 2018). However, after this study, there was an 89% consensus that dietitians should be involved in treating these patients and that including educated dietitians would ensure that patients have access to diet education and lifestyle interventions (Wolf, Wattick, Murray, et al., 2018). Essentially, all of these articles agreed that there is a need for multidisciplinary care for patients with PCOS. Two of the three articles agreed that there is a need and a role for registered dietitians to treat and care for PCOS patients because of the need for nutrition education. However, the gap in the literature is the study of how the intervention of patients with PCOS could benefit from being counseled by registered dietitians regularly as part of treatment versus the education they receive from their practitioners or non-dietetic sources. It is yet to be shown the long-term outcomes of those with PCOS receiving this type of education from an RDN versus trying to learn on their own and navigate what reliable health information is.

Excluded Literature

Three articles ended up being excluded from the literature; one was excluded because it was researching adolescents and protecting long-term fertility in them. The survey was created for women of childbearing age (18-44). The other two articles were excluded because they each included a comparison of women who were controls and had not been diagnosed with PCOS. In the article, *Comparison of Dietary Intakes between Polycystic Ovary Syndrome*, they completed a case-control study on 142 PCOS women and 140 women who matched the ages and BMI of PCOS women but did not have PCOS. The other article, *Dietary Intake, Eating Behavior, Physical Activity, and Quality of Life in Infertile Women with PCOS and Obesity Compared with Non-PCOS Obese Controls*, a randomized control trial of a total of 577 women (between the ages of 18 to 39 years) with or without PCOS and a BMI of above or equal to 29 were used in baseline measures of the analysis of the article. The needs assessment survey is only for women diagnosed with PCOS. From the literature, it is known knowledge among the medical community that women with PCOS have different reactions to food than women without PCOS. Therefore, three articles were excluded from the literature review.

Chapter 3. Methods

A survey was constructed based on other surveys and literature reviewed to assess the nutrition-related knowledge needs of women of childbearing age with PCOS. No questions were taken verbatim from other validated survey instruments, nor were they adapted to the current survey. The review informed the format of survey questions, while the literature informed the content of the questions. The questions were aimed at meeting the study's objectives and addressing gaps in the literature. The objectives of the survey and study were to: 1) determine knowledge of nutrition recommendations for the management of PCOS symptoms among women of childbearing age who have been diagnosed with PCOS; 2) determine what dietary changes (if any) women with PCOS make to manage their symptoms; 3) determine whether or not women with PCOS are referred to an RDN for medical nutrition therapy to manage their symptoms; 4) determine if consultation with an RDN is associated with increased knowledge of nutrition recommendations for PCOS management; 5) determine if consultation with an RDN is associated with changes in dietary behaviors to manage PCOS symptoms; and, 6) determine if there is a need or interest in nutrition education for PCOS management among women diagnosed with PCOS.

The first section of the survey was developed to learn about the symptoms, diagnosis process, advice given by providers to manage their PCOS, and any medication prescribed as treatment. When reading literature and reviewing current treatment methods, most women with PCOS are prescribed hormonal, insulin regulation, or blood pressure-lowering medication. This section gives us a basis for understanding how participants were diagnosed (which criteria), which provider diagnosed them, what kind of symptoms are most common, and what type of medication, if any, was prescribed. The second section was created to assess the nutrition needs

of participants. This section asked if participants had seen an RDN and, if so, what kind of advice was given to them regarding diet and whether the interventions were helpful. Even if they had not seen an RDN, we also asked participants what diets they had tried because most women with PCOS are overweight or obese and trying to lose weight on their own. We also asked questions regarding their symptom management/quality of life, particularly if any diet they had tried helped to manage their symptoms and if overall they felt like their symptoms were being managed/had a good quality of life. We also asked participants if they would be interested in an educational intervention regarding managing symptoms with nutrition and what topics they would want to learn. Finally, we included an optional demographic section to help understand the participants' backgrounds and possible social and economic limitations. No personal or health information was asked within the survey that could be linked back to the participant.

In the study procedures, the participants' inclusion criteria were female students, ages 18-44, with a self-reported diagnosis of PCOS by a licensed practitioner/healthcare provider, and who are currently enrolled in one course at least one college course. Initially, participants were recruited via an email sent from or an announcement posted to the learning management system (D2L) by instructors of both undergraduate and graduate courses in the College of Rehabilitative Health Sciences and the College of Nursing, as the majority of these students are female. The announcement provided pertinent details about the study and the link to the anonymous online survey and consent form. The announcement stated that participants would receive no benefits or incentives for participating in the study, nor would their course grades be impacted by their decision to participate. Additionally, an announcement of the study opportunity was posted to two student organizations' social media pages and distributed through the Honors College listserv. The survey was open on March 21, 2023, until April 13, 2023.

The first question on the survey included the consent script detailing the purpose of the study, what to expect in the study, how their data will be accessed and stored to protect their privacy and confidentiality, and any potential harms and benefits of participating in the study. Participants clicked on the option, “Yes, I have read the informed consent document above and agree to participate in this study,” to enroll and complete the survey. Participants who clicked “No, I do not agree to participate in this study” exited the survey without enrolling. The survey was distributed via SurveyMonkey, a program allowing for secure data collection. When participants answered the survey, no IP addresses were collected when the participants. The platform did not collect any personal information from the participant, nor did the PI and faculty advisor. Survey responses were downloaded from the SurveyMonkey® server as a CSV file and stored in an online OneDrive for Business (ETSU) folder shared by the PI and faculty advisor. Data was then uploaded to SPSS on the faculty advisor’s computer for data cleaning and coding. Data were analyzed using descriptive statistics, as the final sample size was too small to investigate any associations between variables. All analyses and data files were stored in the OneDrive for Business folder. Any free response questions were coded for thematic analysis, with notes stored in the OneDrive for Business folder. The study and all of its materials (survey, recruitment email, etc.) were approved by the Institutional Review Board at East Tennessee State University (Study #2023015) prior to the implementation of the survey.

Chapter 4. Results and Discussion

A total of 20 respondents accessed the survey; however, there were 13 valid responses. Two respondents did not meet our inclusion criteria of being a woman of childbearing age diagnosed with PCOS by a licensed healthcare provider. Therefore, the two respondents who did not meet the inclusion criteria could not finish the survey. Five additional respondents were deleted from the dataset because they needed more data.

Most participants were diagnosed with PCOS by OB/GYN (Figure 1). The third question was a multiple-choice response question asking about their diagnosis criteria; there were ten choices for amenorrhea (38.5%), 11 for ovarian cysts (42.3%), and 5 for hypoandrogenism (19.2%). We cannot tell which women had more than one or two of the diagnosis criteria from this question. However, since there were 26 responses, it could be deduced that each woman had two of the three diagnosis criteria, aligning with the Rotterdam diagnosis criteria. The fourth question was another multiple response that asked the participants what tests were run to diagnose them with PCOS. There were 11 responses (33.3%) for blood tests, ten responses (30.3%) for ultrasounds, and 12 responses (36.4%) for physical exams, out of 33 responses to the question. In a multiple-response format, the fifth question asked participants to choose the symptoms they were experiencing upon diagnosis. There were 56 responses to this question, shown in Figure 2; the two reported symptoms the most from participation included irregular menstrual cycle and weight gain or difficulty losing weight. The sixth question was also multiple responses and asked women if treatment medication was prescribed when they were diagnosed. There was a total of 23 responses among the choices, ten responses (43.5%) for birth control, seven responses (30.4%) for metformin, three responses (13.0%) for Spironolactone (Aldactone), one response (4.3%) for Eflornithine (Vaniqua), one response (4.3%) for Clomiphene (Clomid),

and one response (4.3%) for other. Birth control is a standard treatment for PCOS and other reproductive disorders because there is a hormonal imbalance to be corrected. However, our survey results show seven women out of 13 were also prescribed Metformin. Metformin is in the literature surrounding PCOS because it is an oral medication for type 2 diabetes, which women with PCOS are prone to. So, we see from this question that a little over half of the women who participated struggle with blood sugar control and could be type 2 diabetic.

The second section contained questions on nutrition intervention, and the seventh question began this section with nutrition-related questions. As shown in Figure 3, only one participant out of 12 responders reported being referred. The following question asked if the participant had never been referred or had seen a registered dietitian, and the responses were the same as the previous question. There were 11 responses (84.6%) for “no,” 1 response (7.7%) for “yes,” and one participant did not respond (7.7%). We are assuming that the same participant who answered yes to being referred also answered yes to have they seen a registered dietitian. This shows a lack of referral to RDNs from the providers diagnosing women with PCOS and that our participants with PCOS are not seeking the advice of RDNs for nutrition education related to their PCOS. The ninth question was a multiple-response question that asked about interventions given by an RDN. There was a total of 15 responses, two responses (13.3%) for Healthy Food Swaps, one response (6.7%) for Gluten and Dairy Free, two responses (13.3%) for Low glycemic diet (or low carb/carb counting), three responses (20.0%) for Low calorie or another weight loss plan, and seven responses (46.7%) for “none.” The assumption is that the participants, besides the ones who reported seeing an RDN, were recommended these interventions by another provider or an RDN online/other resources. The tenth question asked if an RDN had seen them and if it was helpful for symptom management for their PCOS. Of the responses to these

questions, eight responses (61.5%) were “no,” and 5 participants did not respond (38.5%). There is an assumption that the participants who responded no were not given a chance to “skip logic” on this question or did not know that it meant only those who had been referred to or received nutrition education directly from an RDN should answer “yes” or “no.” However, the one participant that answered “yes” to seeing an RDN did answer “no”; we do not know why it was not helpful for them or their personal experience. The next question asked what diets the participants had tried for PCOS management, it was another multiple-response answer, and there were 26 responses. There was one response (3.8%) for the Mediterranean diet, one response (3.8%) for the Paleo diet, one response (3.8%) for the DASH diet, one response (3.8%) for the Vegan diet, one response (3.8%) for “other” or a diet not listed, the Keto diet and the Whole30 diet had two responses (7.7%), an anti-inflammatory diet (gluten-free and dairy-free) had three responses (11.5%), the Weight Watchers diet had five responses (19.2%), and lastly the Low-Carb Diet had six responses (23.1%). Then following this question, the twelfth question asked if there had been a diet that improved their PCOS symptom management. There were 4 participants (30.8%) that answered “yes,” 8 participants (61.5%) answered “no,” and one participant (7.7%) did not respond. The two most popular diets tried were Low-Carb and the Weight Watchers diet, and most participants answered that no diet helped improve their symptom management. From this data, we could infer that the Low-Carb diet and Weight Watchers are popular diets these women have tried for weight management with their PCOS. The thirteenth question asked if the participants feel like their PCOS is being managed well, and out of 12 participants that responded, 8 (61.5%) answered “yes.” Following this, the participants were asked if they were interested in learning more about using nutrition to manage their PCOS, and all participants answered “yes,” as shown in Figure 4. Lastly, all participants were asked an open-response

question about possible nutrition education topics. The answers included “How to properly eat and maintain your weight with PCOS,” “Carbohydrates, Cholesterol b/c pt. have a high risk for CAD, and sugar levels,” “Foods that could help with hormonal imbalances,” “Better foods to help w PCOS,” and “Anything!”. From these answers, there were participants specifically wanting to learn more about nutrition related to their PCOS than other nutrition topics. One response noted that they want to know more about nutrition because of their risk of CAD.

The last section was demographic information collected for background information on our participants. This is shown below in Table 2, and the first notable statistic that can be made is that many of our participants were diagnosed with PCOS between the ages of 15-18. Almost all of our participants were Caucasian, except the one who did not respond. The data did not allow for any correlations or other notable comparisons, but it would be important to note the household income and employment status for realistic future nutrition interventions.

Table 2

Demographic Questions

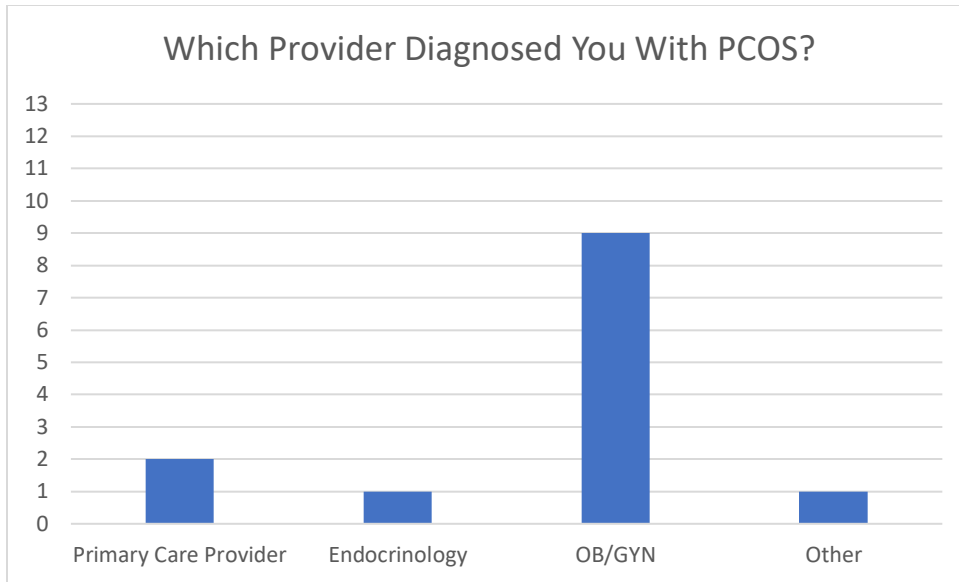
Demographic Categories:	Answer Options Chosen	N	%

Age Range Diagnosed with PCOS	15-18	10	76.9%
	19-25	2	15.4%
	Did not respond	1	7.7%
Race/Ethnicity			
	Caucasian	12	92.3%
	Did not respond	1	7.7%
Highest degree or education level			
	High school diploma or GED	5	38.5%
	Associate degree	1	7.7%
	Bachelor's degree	5	38.5%
	Master's degree	1	7.7%
	Did not respond	1	7.7%
Marital Status			
	Single	8	61.5%
	Married	3	20.0%
	In a domestic relationship	1	7.7%
	Did not respond	1	7.7%
Household Income			
	Under \$25,000	6	40.0%
	\$25,000-\$49,000	1	6.7%
	\$50,000-\$74,000	2	15.4%
	\$75,000-\$99,000	2	15.4%

	Over \$100,000	1	7.7%
	Did not respond	1	7.7%
Employment status			
	Full-time	3	18.0%
	Part-time	5	31.3%
	Self-Employed	1	6.3%
	Student	7	43.8%

NOTE: This table shows the demographic information of the 13 valid responses of participants who had been diagnosed with PCOS.

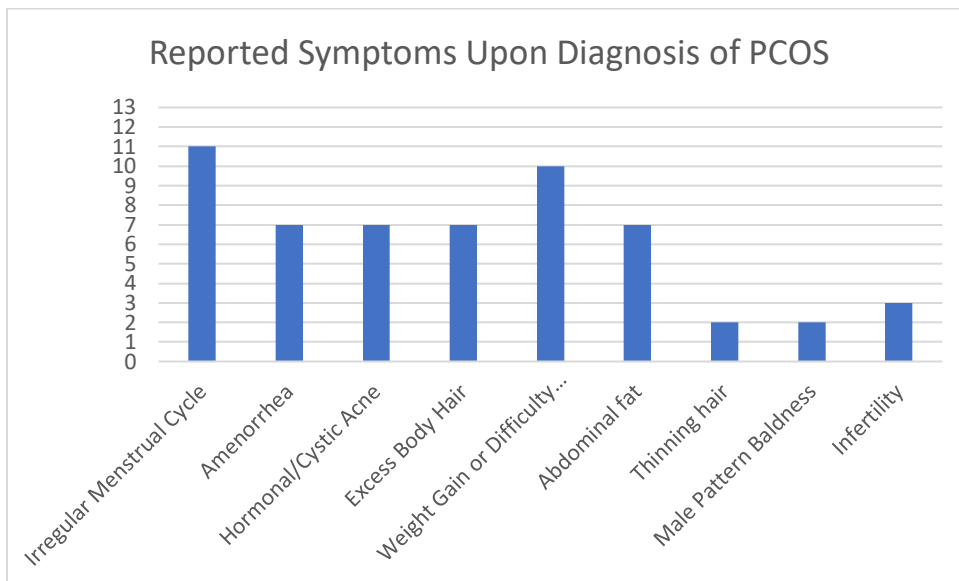
Figure 1
Diagnosis Provider



NOTE: This graph shows which provider diagnosed our participants with PCOS.

Figure 2

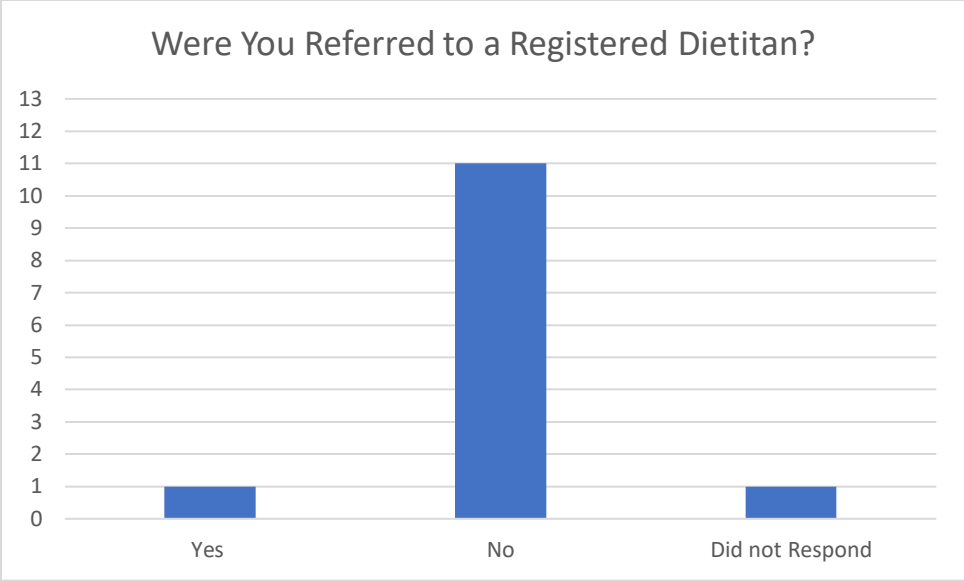
Symptoms Upon Diagnosis



NOTE: This graph shows the multiple symptoms that are common to PCOS women. It was a multiple response question so we could examine which symptoms were experienced most frequently.

Figure 3

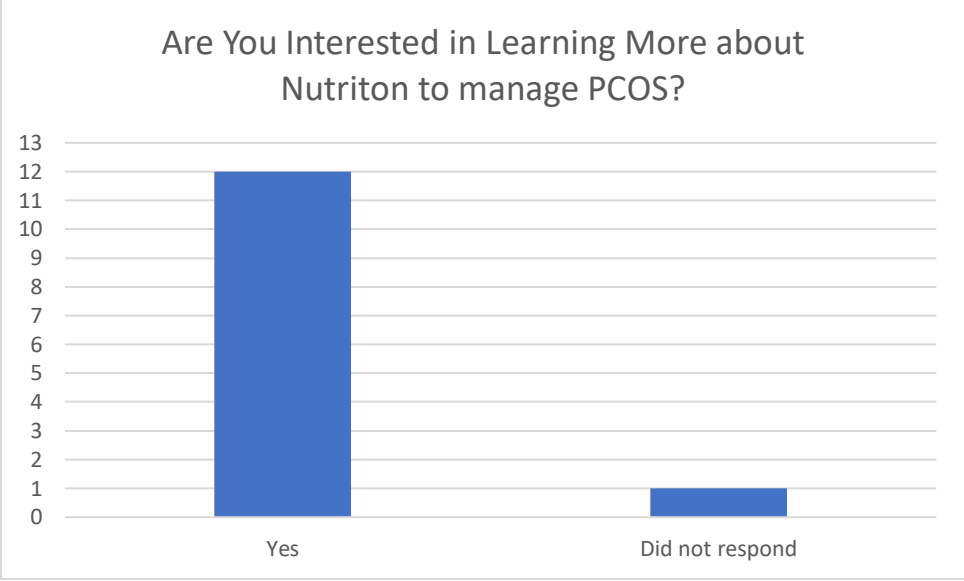
Referral to RDN



NOTE: This graph shows how many women have been referred to an RDN upon diagnosis or during their treatment of PCOS.

Figure 4

Interest in Nutrition Education



NOTE: This graph shows how many women that participated in the survey have an interest in learning about PCOS symptom management with nutrition.

Chapter 5. Conclusion and Recommendations

In conclusion, the strength of this study was its appropriateness in being used as a needs assessment that can be used in further studies for building another needs assessment or used to build an education or nutrition counseling intervention along with a diet intervention. Another strength of our study was that no private health information was taken, so participants had more privacy and no data to distinguish them from other participants. This can help participants be more open to answering truthfully if they know their information is secure and they are not at risk of being identified.

From the results, we can see that only some women diagnosed with PCOS are being referred to a registered dietitian nutritionist, and with no referral, they are not seeking the advice of RDNs. The one participant who did see/was referred to an RDN reported that it was not helpful, which could lead to further questions. For example, what nutrition education are they receiving for the women who are seeing RDNs, and what is not helpful? In a further study, interviews with participants or focus groups could help with some of these questions. This also leads to future research to see how nutrition education sessions with an RDN educated in PCOS or Women's Health could help with the gap in nutrition education about PCOS symptom management and disease prevention in PCOS women. We know from the data that most women have been diagnosed with PCOS by their OB/GYN, so this could mean research or studies that include OB/GYNs referring women with PCOS to RDNs upon diagnosis or for general symptom management in later appointments.

In the survey results, the type of diets that PCOS women have tried was asked so there could be further studies on which of these diets could best help with symptom management and would have the best adherence long-term. Four participants reported that a diet helped with their

symptom management, so asking women what diets they tried and which worked versus those that did not. In another survey or questionnaire, a question to be asked or examined could also be where women with PCOS are getting nutrition education. This could explain why they have tried their diets and what misinformation they believe would need to be corrected in nutrition education sessions with an RDN. The data also showed that weight gain or difficulty losing weight was the most common symptom experienced by our participants besides irregular menstrual cycles. This supports the literature and what is known to be true of PCOS. We can know that women need education surrounding weight management and properly nourishing their bodies for metabolic symptom management. The answers in Figure 4 shows that women with PCOS from our study are interested in nutrition education surrounding symptom management and PCOS. The free response question about possible nutrition topics also supports this. If nutrition education and intervention were implemented, women would likely be receptive and interested in shared information.

There were limitations to this study that could be corrected in future research or if replicated again, the first limitation being the limited number of responses received. This could be corrected in future studies with more advertising, the survey sent out to private healthcare practices, or if the survey was open longer. Another limitation was using Survey Monkey instead of a more robust platform for the survey because there were some problems with participants not answering required questions and the “skip logic” not always working for the questions assigned. If this survey were to be replicated, it would be helpful to use a platform like Qualtrics or similar platforms to prevent these types of technology limitations hopefully.

This study completed the goal of being a needs assessment for the target audience, women of childbearing age diagnosed with PCOS. However, some limitations could be

improved for further studies or replications. Further research needs to be completed on PCOS as a reproductive and metabolic disorder, how RDNs could be added to the healthcare team of PCOS women for treatment, and what diet could be the standard recommendation for symptom management and improvement in the quality of life of PCOS women. This study could be replicated and improved upon or used as a tool to begin the implementation of nutrition education/diet interventions.

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APPENDICES

Appendix A: Consent Form/ Survey

Consent for Research Participation

Research Study Title: *Nutrition Needs Assessment for Women of Childbearing Age with Polycystic Ovarian Syndrome*

Dear Participant:

My name is Callie Coleman, and I am a student researcher at East Tennessee State University. I am working on my Honors Thesis in Nutrition. The title of my research study is Nutrition Needs Assessment for Women of Childbearing Age with Polycystic Ovarian Syndrome.

The purpose of this study is to assess the knowledge that women of childbearing age with a diagnosis of PCOS have about nutrition as it correlates to symptom management of PCOS. I am providing an online survey to women of childbearing age who have a diagnosis of PCOS from a provider. PCOS is not only an endocrine disorder, but a metabolic disorder as well because of their hormonal imbalance and endocrine system disruption. Metabolic symptoms of PCOS include insulin resistance, certain food intolerances, and increased risk of developing diseases like type 2 diabetes, cardiovascular disease, high cholesterol, metabolic syndrome, and obesity. If you choose to participate in the study, you would be helping to identify knowledge gaps women have about nutrition affecting their PCOS. The goal of the study is to find these gaps and then we will be able to understand where women with PCOS need knowledge, so they can better manage their symptoms. It will also help us to identify if any women who have seen a registered dietitians have better management of their symptoms. Therefore, showing us that women with PCOS could benefit from a referral to an RDN upon diagnosis.

This study women who have been diagnosed with PCOS in the long-term and women who will be diagnosed in the future. However, we do not expect you to benefit from being in this study. Your participation can help in determining the knowledge gaps and misconceptions we hope to identify from the survey. Your participation may help us to improve the healthcare team of women with PCOS.

The survey is on Qualtrics, an online platform. It should take between 10-15 minutes to complete. You will be asked questions about symptoms you've experienced, if you have seen or been referred to a Registered Dietitian, what diets you might have tried, and optional demographic questions. There is an opportunity within the survey to further explain your answers. Taking part in this study is voluntary. You may decide not to take part in this study. You can quit at any time. You may skip any questions you do not want to answer, or you can exit the online survey form if you want to stop completely.

There aren't any identifiable risks to you from being in the study that are greater than the risks that you encounter in everyday life.

Your confidentiality will be protected as best as we can. Since we are using technology, no guarantees can be made about the interception of data sent over the internet by any third parties, just like with emails. We will make every effort to make sure your name is not linked with your answers. Qualtrics has security features that will be used, like not collecting IP addresses and SSL encryption will be used to ensure your privacy and security.

Although your rights and privacy will be maintained, the research records may be looked at by individuals that have the legal right to see that information. This may include the ETSU IRB overseeing this research, other individuals at the University with the responsibility for ensuring we follow the rules related to this, research the federal Office of Human Research Protections (OHRP) that protects participants like you, ETSU health offices, and the research team.

All information that can identify you will be removed from the data. This data will then be stored for possible use in future research studies. We will not ask for additional consent for those studies.

If you have any research-related questions or problems, you may contact me, Callie Coleman, or my faculty research advisor, Whitney Bignell, at (423-439-7537). This research is being overseen by an Institutional Review Board (IRB). An IRB is a group of people who perform independent review of research studies. You may also contact the ETSU IRB at 423-439-6054 or IRB@etsu.edu for any issues, questions or input that you may have about the research or your rights as a research participant.

Sincerely,

Callie Coleman
Contact Email: colemancg@etsu.edu

Research Partner and Advisor:

Whitney Bignell, PhD, RD, LDN
Assistant Professor
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Section 1: Polycystic Ovarian Syndrome Diagnosis/Symptoms

1. Have you been diagnosed with polycystic ovarian syndrome by a licensed healthcare provider?
 - a. Yes
 - b. No

2. Which provider diagnosed you with PCOS?
 - a. Primary Care Provider (Family practitioner or doctor)
 - b. Endocrinologist
 - c. Obstetrician-gynecologist (OBGYN)

3. What was your diagnosis based upon? (Select all that apply)?
 - a. Amenorrhea (3 months or more without a period)/ irregular period (ovulatory dysfunction)
 - b. Cysts on ovaries
 - c. Hyperandrogenism (excess in male hormones like testosterone)
 - d. Other

4. What tests or labs were used to diagnose your PCOS? (Select all that apply)
 - a. Blood tests
 - b. Ultrasound
 - c. Physical exam
 - d. Other

5. What were your symptoms upon diagnosis?
 - a. Irregular menstrual cycle
 - b. Amenorrhea (3 months or more without a period)
 - c. Hormonal/cystic Acne

- d. Excess body hair on face, chest, stomach, or back (hirsutism)
 - e. Weight gain or difficulty in losing weight.
 - f. Excess body fat around the belly (abdomen)
 - g. Thinning hair
 - h. Male-pattern baldness
 - i. Infertility
6. When diagnosed, were you prescribed a medication to help with your symptoms of PCOS or given a medication treatment?
- a. Birth control of some form
 - b. Metformin (Glucophage)
 - c. Spironolactone (Aldactone)
 - d. Eflornithine (Vaniqa)
 - e. Clomiphene (Clomid)
 - f. Other

Section 2: Nutrition in Relation to Polycystic Ovarian Syndrome

7. Were you referred to a registered dietitian, when diagnosed with PCOS or when trying to manage your PCOS?
- a. Yes
 - b. No
8. If not referred, have you ever seen a registered dietitian after being diagnosed with PCOS?
- a. Yes
 - b. No
9. If you were referred or have been to a registered dietitian, what nutrition plan or intervention was given to you? (Select any or all that apply if you have had a consult with a Registered Dietitian)
- a. Meal plan with suggestions of healthier meals/talking about healthy food and drink swaps.

- b. A diet to follow (like Mediterranean, Keto, Paleo, DASH diet)
 - c. Suggestion of gluten free or dairy free
 - d. Low glycemic diet (or low carb/carb counting)
 - e. Lower calorie diet or another weight loss plan
 - f. None
 - g. Other
10. If you were referred or have been to a registered dietitian, do you feel like it was helpful for your symptom management and understanding of how food affects your symptoms?
- a. Yes
 - b. No
11. Have you tried any of the following diets for PCOS management even if you weren't referred to a Registered Dietitian (select all that apply)
- a. The Mediterranean diet
 - b. Keto diet
 - c. Paleo diet
 - d. DASH diet
 - e. Low-Carb diet
 - f. Anti-inflammatory diet (like Gluten free and dairy free)
 - g. Whole30 diet
 - h. Vegan diet
 - i. Weight Watchers
 - j. Other
12. If you have tried any of these diet or nutrition plans, was there one that seemed to improve your symptom management/quality of life?
- a. Yes
 - b. No
13. Do you feel that your symptoms of PCOS are being managed well, or do you feel you have a good quality of life even with PCOS?
- a. Yes
 - b. No

14. Are you interested in learning more about nutrition to manage PCOS?
 - a. Yes (if yes, which of the following topics interest you?)
 - b. No

15. List possible topics for nutrition education

Section 3: Optional Demographic Questions:

1. What age range were you diagnosed with PCOS?
 - a. 15-17
 - b. 19-25
 - c. 26-35
 - d. 36-40
 - e. Prefer not to say.

2. What is your race/ethnicity?
 - a. American Indian or Alaska Native
 - b. Asian
 - c. African American
 - d. Hispanic or Latino
 - e. Native Hawaiian or Other Pacific Islander
 - f. Caucasian
 - g. Other:
 - h. Prefer not to say.

3. What is the highest degree or education level you have completed?
 - a. Some high school
 - b. High school diploma or GRE
 - c. Associate degree
 - d. Bachelor's degree

- e. Master's degree
 - f. Doctorate/Professional degree
 - g. Trade School
 - h. Prefer no to say.
4. What is your current employment status (may need to make select all that apply)
- a. Employed full-time.
 - b. Employed part-time.
 - c. Self-employed
 - d. Not currently employed.
 - e. Student
 - f. Prefer not to say.
5. What is your marital status?
- a. Single
 - b. Married
 - c. In a domestic partnership
 - d. Divorced
 - e. Prefer not to say.
6. What is your annual household income?
- a. Under \$25,000
 - b. \$25,000-\$49,000
 - c. \$50,000-\$74,000
 - d. \$75,000-\$99,000
 - e. Over \$100,000
 - f. Prefer not to say.

VITA

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