International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Manjula S et al. Int J Reprod Contracept Obstet Gynecol. 2024 Nov;13(11):3268-3274
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20243188

Original Research Article

Clinicians' perspectives on nutritional supplementation and polycystic ovary syndrome management in women in Indian settings

Manjula S.*, Krishna Kumar M.

Department of Medical Services, Micro Labs Limited, Bangalore, Karnataka, India

Received: 10 September 2024
Accepted: 09 October 2024

***Correspondence:**
Dr. Manjula S.,
E-mail: drmanjulas@gmail.com

ABSTRACT

Background: Although there were several clinical studies available, there was a dearth of studies among clinicians in actual practice. So, this study seeks to gather expert perspectives on protein supplementation and the management of polycystic ovary syndrome (PCOS) among women, with a special focus on the myo-inositol and D-chiro-inositol combination in Indian settings.
Methods: This cross-sectional study was conducted using a 24-question multi-response questionnaire directed at clinicians. The survey explored practices and opinions on protein supplementation, including frequency, target populations, nutritional status, and timing. It also investigated PCOS prevalence, symptoms, types, treatment recommendations, and dietary adjustments. The perceived effectiveness of myo-inositol and D-chiro-inositol combinations, particularly in conjunction with hormonal therapy and in vitro fertilization (IVF), was assessed. Data were analyzed using descriptive statistics.
Results: Most clinicians (96.59%) identified pregnant or lactating women as the primary group requiring protein supplementation, with 72.73% recommending 26 grams per day. Nearly 95% reported PCOS was commonly diagnosed in women aged 18 to 44 years, and 72% noted that insulin resistance PCOS was more prevalent. Infertility was cited as the main impact of unmanaged PCOS by 67% of respondents. Approximately 43% of clinicians found the myo-inositol and D-chiro-inositol (40:1 ratio) combination to improve PCOS treatment significantly. Additionally, 40% of the experts reported that the supplementation enhances ovarian function, 31% noted improved menstrual cycle regularization, and 77% reported benefits in ovulation, folliculogenesis, and egg quality when combined with IVF.
Conclusions: This study highlighted the importance of protein supplementation for pregnant and lactating women and supports the myo-inositol and D-chiro-inositol combination as a beneficial treatment for PCOS.

Keywords: D-chiro-inositol, Myo-inositol, Nutrition supplementation, Polycystic ovary syndrome

INTRODUCTION

Maternal undernutrition continues to be a significant public health concern in many low- and middle-income countries, where more than 20% of women are frequently malnourished.[1,2] According to the National Family Health Survey (NFHS)-4, conducted by the Ministry of Health and Family Welfare of India in 2015-16, 22.9% of the women aged 15-49 are underweight, with a body mass index (BMI) of <18.5 kg/m^2. The states with the highest percentages of malnutrition among women are Jharkhand (31.5%), Bihar (30.4%), Dadra and Nagar Haveli (28.7%), Madhya Pradesh (28.4%), Gujarat (27.2%), and Rajasthan (27%).[3]

Nutritional supplementation has become an increasingly prevalent strategy to address various health concerns and enhance overall well-being among women.[4] Undernourished pregnant women are at an increased risk for adverse pregnancy outcomes, including giving birth to low birth weight and small for gestational age infants. Providing balanced protein energy supplementation (i.e.,

supplements in which protein provides less than 25% of the total energy content) to undernourished pregnant women has been shown to promote gestational weight gain and improve pregnancy outcomes.[5] Studies have indicated that providing women with supplements of over 2,920 kJ (700 kcal)/day, during pregnancy, containing up to 25% of energy as protein, can reduce the risk of having a low-birth-weight baby by 32%.[6-8]

Polycystic ovary syndrome (PCOS) affects an estimated 8-13% of reproductive-aged women, but up to 70% of those affected may remain undiagnosed globally. PCOS is the most common cause of anovulation and a leading factor in infertility.[9] It is characterized by hormonal imbalances, irregular menstrual cycles, and polycystic ovaries, and often presents with symptoms such as insulin resistance and obesity. The global prevalence of PCOS is estimated to range between 4% and 20%, with approximately 116 million women (3.4%) affected worldwide, according to data from the World Health Organization (WHO). In India, the National Health Portal reports a prevalence rate of 22.5% in Maharashtra, while a study from South India, which included adolescents, identified an incidence of 9.13%.[10-13]

Managing PCOS requires a comprehensive approach that addresses the metabolic and reproductive challenges associated with the condition.[10] For effective management of PCOS, both pharmacological and non-pharmacological treatment approaches are vital. The target of PCOS treatment strategies is to address insulin resistance, oligoovulation, and hyperandrogenism.[14] According to the International Evidence-Based Guidelines for the Assessment and Management of Polycystic Ovary Syndrome, lifestyle modifications such as dietary interventions are recommended as first-line therapy for managing the metabolic complications of PCOS.[15]

In recent years, inositol has gained significant attention in reproductive clinical practice due to its potential benefits in managing PCOS. The therapeutic basis for using inositol in PCOS is rooted in its insulin-sensitizing properties and beneficial metabolic effects. Inositol is classified as an insulin-sensitizing agent and is primarily used as a chronic treatment for PCOS.[16] There are two main stereoisomers of inositol: myo-inositol and D-chiro-inositol. Both function as insulin second messengers, mediating different actions of insulin and thus improving metabolic and ovulatory functions. Myo-inositol has been shown to enhance oocyte energy status and quality, while D-chiro-inositol is effective in rapidly reducing peripheral hyperinsulinemia. The combination of these inositol stereoisomers contributes to better management of PCOS.[16,17]

Although there were several clinical studies available, there was a dearth of studies among clinicians in actual practice. So, this survey-based study seeks to gather expert opinions on the preferences and practices for prescribing protein supplementation in women's health and the management of PCOS within Indian clinical settings, with a particular emphasis on the use of myo-inositol and D-chiro-inositol.

METHODS

We carried out a cross sectional, multiple-response questionnaire-based study among gynecologists specialized in treating PCOS patients in the major Indian cities from June 2023 to December 2023.

An invitation was sent to leading gynecologists in managing PCOS in the month of March 2023 for participation in this Indian survey. About 88 gynecologists from major cities of all Indian states representing the geographical distribution shared their willingness to participate and provide necessary data. Clinicians were provided the option to skip any questions they did not wish to answer and were instructed to complete the questionnaire independently, without consulting their colleagues. Prior to the initiation of the study, written informed consent was obtained from all study participants.

The questionnaire booklet titled NURTURE (nutritional supplementation for women health) study was sent to the gynecologists who were interested to participate. The NURTURE study questionnaire consists of 24 questions on the use of protein supplementation for pregnant or lactating women and the management of PCOS in women. The survey explored practices and opinions on protein supplementation, including frequency, target populations, nutritional status, and timing. It also investigated PCOS prevalence, symptoms, types, treatment recommendations, and dietary adjustments. The perceived effectiveness of myo-inositol and D-chiro-inositol combinations, particularly in conjunction with hormonal therapy and in vitro fertilization (IVF), was assessed. The study was conducted after receiving approval from Bangalore Ethics, an independent ethics committee which was recognized by the Indian Regulatory Authority, Drug Controller General of India.

Statistical analysis

The data were analyzed using descriptive statistics. Categorical variables were presented as percentages to provide a clear insight into their distribution. The frequency of occurrence and the corresponding percentage were used to represent the distribution of each variable. To visualize the distribution of the categorical variables, graphs, and pie charts were created using Microsoft Excel 2013 (version 16.0.13901.20400).

RESULTS

In this study, 41% of gynecologists reported prescribing protein supplementation to 31-40% of women visiting their clinics, while 38% recommended it to 21-30% of their female patients. Most (96.59%) of the clinicians stated that pregnant or lactating women are the most

common category requiring protein supplementation (Table 1). As reported by 44% of the clinicians, around 21 to 30% of pregnant women are malnourished. About 30% of the respondents stated that they would advise protein supplementation to 51 to 75% of pregnant or lactating women.

Table 1: Distribution of response on the category of women commonly requiring protein supplementation.

Category	Response rate (n=88)
Pregnant/lactating women	96.59%
Elderly women	3.41%
Post-menopausal women	0%
Adolescent age	0%

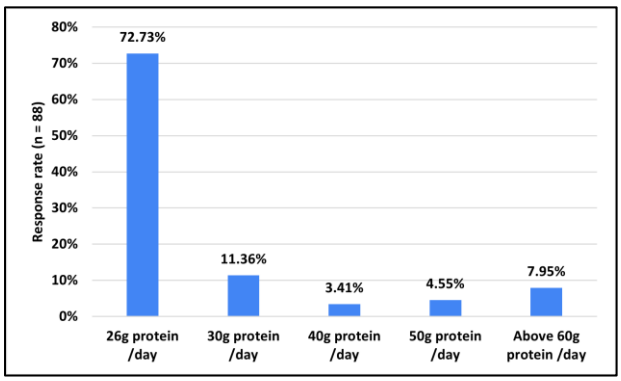

Figure 1: Distribution of response to the preferred amount of daily protein supplementation.

More than half (52.27%) of the participants indicated that less than 10% of neonates are born with birth defects due to nutritional deficiencies. A significant proportion (72.73%) of the clinicians preferred recommending 26 grams of protein per day to women in their clinical practice (Figure 1). Almost 83% of the respondents indicated they advise protein supplementation with multivitamins and minerals from the second trimester to six months of lactation. Around 26 to 50% of pregnant women are compliant with the supplementation, as reported by 53% of the clinicians.

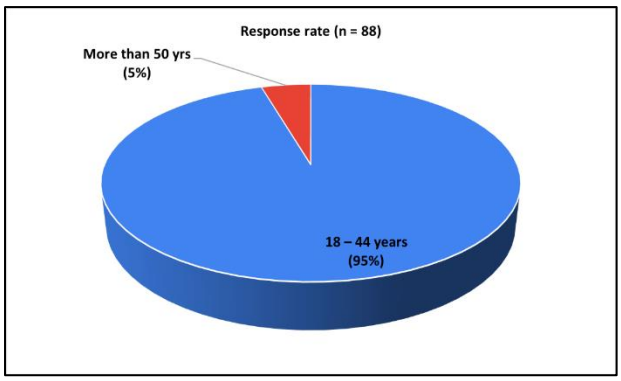

Figure 2: Distribution of response to the age group of patients diagnosed with PCOS.

Majority (95.45%) of the clinicians reported that PCOS is usually diagnosed in women between the ages of 18 and 44 years of age (Figure 2). Around 63% of the respondents reported that 21 to 30% of obese women have PCOS. As stated by 78% of the respondents, the common complaints noted in PCOS patients are irregular periods, excess facial hair growth and acne, weight gain, and infertility.

Table 2: Distribution of response to the common type of PCOS noted in women.

Type of PCOS	Response rate (n=88)
Insulin resistance PCOS	71.59%
Hidden PCOS: thyroid disease	13.64%
Inflammatory PCOS	11.36%
Post-pill PCOS	2.27%
Deficiency of iodine	1.14%
Adrenal PCOS	0%

Most of the clinicians (71.59%) reported that insulin-resistant PCOS is more common in women (Table 2). Majority of the clinicians (62.5%) noted an increased luteinizing hormone/follicle-stimulating hormone (LH/FSH) ratio to be the most significant hormonal indicator of PCOS. As reported by 67% of the participants, infertility was the most common impact of unmanaged PCOS (Figure 3).

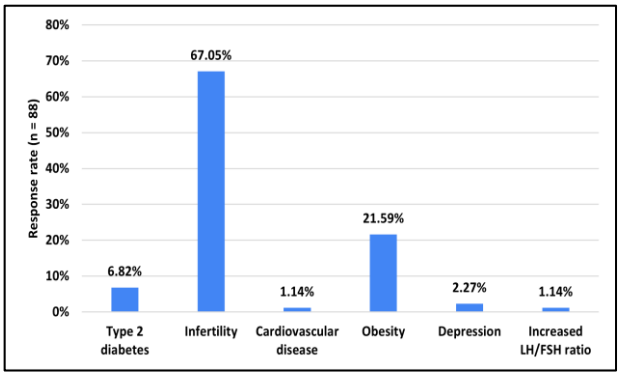

Figure 3: Distribution of response to the most common impact of unmanaged PCOS

Table 3: Distribution of response to the effectiveness of myo-inositol and D-chiro-inositol (40:1 ratio) in PCOS treatment.

Effectiveness	Response rate (n=88)
No change	1.14%
Slight improvement	9.09%
Moderate improvement	22.73%
Obvious improvement	43.18%
Marked improvement	23.86%

According to 47% of the clinicians, high-sugar beverages and foods should be avoided by PCOS patients. Around 42% of the clinicians recommended consuming more

high-fiber foods in the daily diet of PCOS patients. According to 43% of clinicians, between 11 to 20% of women are aware of PCOS and its complications. Around 43% of the clinicians opined that the combination of myo-inositol and D-chiro-inositol in a 40:1 ratio in PCOS treatment shows obvious improvement (Table 3).

As reported by 40% of clinicians, the combination of myo-inositol and D-chiro-inositol with hormonal therapy was perceived to improve ovarian function while 31% of them reported that it improves the regularization of the menstrual cycle (Figure 4). More than half of the clinicians (77.27%) reported that the advantages of myo-inositol and D-chiro-inositol combination with IVF treatment promote ovulation and improve folliculogenesis and oocyte quality (Table 4).

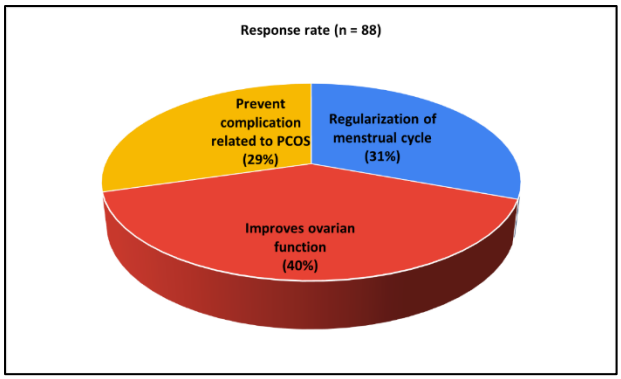

Figure 4: Distribution of response to the perspectives on the advantages of myo-inositol and D-chiro-inositol in combination with hormonal therapy.

Table 4: Distribution of response to the clinicians on the advantages of myo-inositol and D-chiro inositol combination with IVF treatment.

Advantages	Response rate (n=88)
Promotes ovulation	3.41%
Improvement in folliculogenesis	7.95%
Improves oocyte quality	11.36%
All of the above	77.27%

As reported by 69% of the clinicians, the preferred timing for myo-inositol and D-chiro-inositol (Fertiplus) in IVF was between 2 to 3 months before IVF. According to 48% and 47% of the clinicians, the common complaints reported in metformin therapy for PCOS patients are gastrointestinal (GI) disturbance and nausea and vomiting, respectively. As opined by 30% and 27% of the clinicians, the preferred methods for educating pregnant women on nutrition are small group interactive sessions and mass education through social media, respectively. Majority of the respondents (76%) noted that the factor associated with non-adherence to medication in PCOS patients was a lack of patient education.

DISCUSSION

The survey highlights the significant role of protein supplementation in women's health, particularly for pregnant or lactating women. The positive feedback on the myo-inositol and D-chiro-inositol combination, particularly its benefits in IVF treatment, suggests its potential as a valuable component of PCOS management protocols.

The protein content in the supplements, considering the overall diet, is a crucial factor affecting fetal growth. Studies have demonstrated that providing balanced protein-energy supplementation (constituting up to 20% of energy as protein) to pregnant women with energy or protein deficiency seems to enhance fetal growth, increase birth weight (by 95-324 gm) and height (by 4.6-6.1 mm), and reduce the percentage of low birth weight (by 6%).[8,18] Another study suggested that increasing protein intake during pregnancy and lactation can improve birth outcomes and support maternal health by meeting the physiological changes and demands of these stages.[19] Protein requirements during pregnancy, as determined by the Institute of Medicine (IOM), are derived using a factorial method that considers protein deposition and the additional protein needed to support healthy weight gain. In the first trimester, the additional protein need was minimal at approximately 1 gm/day, with the estimated average requirement (EAR) remaining the same as for non-pregnant women at 0.66 gm/kg body weight (bw)/day. During the second and third trimesters, protein needs increase by an average of 21 gm/day, resulting in an EAR of 0.88 gm/kg bw/day.[20,21] Kominiarek stated increased protein requirements for pregnant (an additional 25 gm/day) and lactating women (an extra 15-20 gm/day), emphasizing the importance of protein for maternal and fetal health.[22] This aligns with our present study findings.

In the present survey, majority of the clinicians reported that PCOS was usually diagnosed in women of the age group between 18 to 44 years. In line with this, Azziz et al reviewed over 1,000 women with hyperandrogenism and found that the majority of PCOS diagnoses were in women aged 18 to 44 years, highlighting the prevalence of PCOS among reproductive-aged women.[23] Dumesic et al in the comprehensive review outlines the epidemiology of PCOS, noting that it was most commonly diagnosed in women of reproductive age, specifically between 18 and 44 years.[24] In a clinical review by Goodman et al emphasized that the disorder was typically diagnosed in women between 18 and 44 years of age.[25]

Most of the survey respondents reported that insulin resistance PCOS was more common in women. Similarly, Azziz et al reported that insulin resistance was a common feature in PCOS, affecting approximately 50-70% of women with the condition.[23] DeUgarte et al indicated that in patients with PCOS, the prevalence of insulin resistance was 64% according to the homeostatic model assessment (HOMA)-insulin resistance measurement, and patients

with insulin resistance were more clinically affected.[26] Goodarzi et al. also confirmed the high prevalence of insulin resistance in women with PCOS.[27]

The survey findings also emphasized infertility as the most common impact of unmanaged PCOS. According to the WHO, PCOS was the leading cause of infertility in women.[9] Boomsma et al in a meta-analysis reported that unmanaged PCOS significantly reduces fertility rates, concluding that women with PCOS have lower pregnancy rates and higher rates of miscarriage compared to women without the condition.[28] Kicińska et al also stated that PCOS was the most common cause of infertility.[29] March et al highlighted that PCOS affects about 12-21% of women of reproductive age, underscoring that infertility was a major issue, with many women seeking medical assistance due to difficulties in conceiving. The study indicated that anovulation and irregular menstrual cycles, common in PCOS, were primary contributors to infertility.[30]

The present survey findings also highlight that the combination of myo-inositol and D-chiro-inositol in a 40:1 ratio has shown significant improvements in the treatment of PCOS. Both experimental and clinical studies suggest that myo-inositol, either alone or combined with D-chiro-inositol in this ratio (which reflects natural blood levels), was promising for addressing the metabolic, hormonal, and reproductive issues associated with PCOS, and for restoring ovulation in hyperinsulinemic women.[16,31-33] Kalra et al concluded that this combination improves ovarian function and menstrual cycle regularity in women undergoing hormonal therapy for PCOS.[34] Similarly, Benelli et al indicated that the combined therapy of myo-inositol and D-chiro inositol was effective in improving endocrine and metabolic parameters in PCOS affected women.[35] Colazingari et al in their randomized trial also summarized that this combination contributes to enhanced ovarian function and menstrual cycle regularity in women undergoing hormonal therapy for PCOS.[36]

Most survey participants emphasized the benefits of combining myo-inositol and D-chiro-inositol in IVF treatment, noting its role in promoting ovulation, improving folliculogenesis, and enhancing oocyte quality. Clinical trials by Mohammadi et al reported that this supplementation improved ovarian reserve and increased pregnancy rates in women undergoing IVF, with notable improvements in folliculogenesis and egg quality.[37] Zheng et al concluded that myoinositol alone and in combinations can increase the clinical pregnancy rate in infertile women undergoing ovulation induction for intracytoplasmic sperm injection (ICSI) or in vitro fertilization embryo transfer (IVF-ET). This may improve the quality of embryos, reduce the number of unsuitable oocytes, and decrease the required amount of stimulation drugs.[38] Merviel et al also indicated that myo-inositol was effective in normalizing ovarian function and improving oocyte and embryo quality in PCOS.[39] Mendoza et al also concluded that the combination of myo-inositol and D-chiro-inositol was more effective than either supplement alone in improving ovulation rates and reproductive outcomes.[40]

The results of the current survey could assist clinicians in making informed clinical decisions and improving patient care by integrating preferences and practices related to protein supplementation and PCOS management in Indian settings. The primary strength of the survey lies in its use of a well-designed and validated questionnaire to gather data from clinicians. However, several limitations should be noted. The results may be biased due to their reliance on expert opinion, and diverse perspectives among clinicians could influence the outcomes. Additionally, the survey may not fully account for emerging evidence or evolving trends in PCOS management. These limitations should be considered when interpreting the findings. To address them, it was recommended to conduct prospective trials or real-world observational studies to validate the survey results and obtain a more comprehensive understanding of optimal treatment approaches.

CONCLUSION

This study highlights the critical role of protein supplementation for pregnant and lactating women. It also underscored the significant benefits of combining myo-inositol and D-chiro-inositol in PCOS treatment, showing improvements in ovarian function and menstrual regularity, especially when used with hormonal therapy. Notably, this combination enhances ovulation, folliculogenesis, and egg quality in IVF treatments, demonstrating its value in improving reproductive outcomes and ovarian health.

ACKNOWLEDGEMENTS

We would like to thank all the consultants who participated in this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Alotaibi AF, Khdary SN, Alzarzor Alajami MA, Sambas EA, Aldakhil NA, Naibulharam DY, et al. Pattern of dietary supplement use and its psychosocial predictors among females visiting fitness centers in Saudi Arabia: Findings from a cross-sectional study. Saudi Pharm J. 2024;32(3):101966.
2. Chea N, Tegene Y, Astatkie A, Spigt M. Prevalence of undernutrition among pregnant women and its differences across relevant subgroups in rural Ethiopia: a community-based cross-sectional study. J Health Popul Nutr. 2023;42:17.
3. Malnutrition among Women. Available from: https://pib.gov.in/newsite/PrintRelease.aspx?relid=200142. Accessed on 23 July 2024.

4. Feskens EJM, Bailey R, Bhutta Z, Biesalski HK, Eicher-Miller H, Krämer K, et al. Women's health: optimal nutrition throughout the lifecycle. Eur J Nutr. 2022;61(Suppl 1):1-23.
5. WHO. High-protein supplementation during pregnancy. Available from: https://www.who.int/tools/elena/ interventions/high-protein-pregnancy. Accessed on 23 July 2024.
6. Barros FC, Bhutta ZA, Batra M, Hansen TN, Victora CG, Rubens CE, et al. Global report on preterm birth and stillbirth (3 of 7): evidence for effectiveness of interventions. BMC Pregnancy Childbirth. 2010;10(Suppl 1):S3.
7. Bhutta ZA, Ahmed T, Black RE, Cousens S, Dewey K, Giugliani E, et al. What works? Interventions for maternal and child undernutrition and survival. Lancet. 2008;371(9610):417-40.
8. Liberato SC, Singh G, Mulholland K. Effects of protein energy supplementation during pregnancy on fetal growth: a review of the literature focusing on contextual factors. Food Nutr Res. 2013;57:24235913.
9. WHO. Polycystic ovary syndrome. Available from: https://www.who.int/news-room/fact-sheets/detail/polycystic-ovary-syndrome. Accessed on 23 July 2024.
10. Kiani AK, Donato K, Dhuli K, Stuppia L, Bertelli M. Dietary supplements for polycystic ovary syndrome. J Prev Med Hyg. 2022;63(2 Suppl 3):E206-13.
11. Madnani N, Khan K, Chauhan P, Parmar G. Polycystic ovarian syndrome. Indian J Dermatol Venereol Leprol. 2013;79:310.
12. Bulsara J, Patel P, Soni A, Acharya S. A review: brief insight into polycystic ovarian syndrome. Endocr Metab Sci. 2021;3:100085.
13. Jabeen A, Yamini V, Rahman Amberina A, Dinesh Eshwar M, Vadakedath S, Begum GS, et al. Polycystic ovarian syndrome: prevalence, predisposing factors, and awareness among adolescent and young girls of south India. Cureus. 2022;14(8):e27943.
14. Jungari M, Choudhary A, Gill NK. Comprehensive management of polycystic ovary syndrome: effect of pharmacotherapy, lifestyle modification, and enhanced adherence counselling. Cureus. 2023;15(2):e35415.
15. Teede HJ, Misso ML, Costello MF, Dokras A, Laven J, Moran L, et al. Recommendations from the international evidence-based guideline for the assessment and management of polycystic ovary syndrome. Fertil Steril. 2018;110(3):364-79.
16. Roseff S, Montenegro M. Inositol treatment for PCOS should be science-based and not arbitrary. Int J Endocrinol. 2020;2020(1):6461254.
17. Unfer V, Porcaro G. Updates on the myo-inositol plus D-chiro-inositol combined therapy in polycystic ovary syndrome. Expert Rev Clin Pharmacol. 2014;7(5):623-31.
18. Ota E, Hori H, Mori R, Tobe-Gai R, Farrar D. Antenatal dietary education and supplementation to increase energy and protein intake. Cochrane Database Syst Rev. 2015;(6):CD000032.
19. Picciano MF. Pregnancy and lactation: physiological adjustments, nutritional requirements and the role of dietary supplements. J Nutr. 2003;133(6):1997S-2002S.
20. Trumbo P, Schlicker S, Yates AA, Poos M. Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein and amino acids. (Commentary). J Am Dietetic Assoc. 2002;102(11):1621-31.
21. Murphy MM, Higgins KA, Bi X, Barraj LM. Adequacy and sources of protein intake among pregnant women in the United States, NHANES 2003-2012. Nutrients. 2021;13(3):795.
22. Kominiarek MA, Rajan P. Nutrition Recommendations in Pregnancy and Lactation. Med Clin North Am. 2016;100(6):1199-215.
23. Azziz R, Sanchez LA, Knochenhauer ES, Moran C, Lazenby J, Stephens KC, et al. Androgen excess in women: experience with over 1000 consecutive patients. J Clin Endocrinol Metab. 2004;89(2):453-62.
24. Dumesic DA, Oberfield SE, Stener-Victorin E, Marshall JC, Laven JS, Legro RS. Scientific statement on the diagnostic criteria, epidemiology, pathophysiology, and molecular genetics of polycystic ovary syndrome. Endocr Rev. 2015;36(5):487-525.
25. Goodman NF, Cobin RH, Futterweit W, Glueck JS, Legro RS, Carmina E. American Association of Clinical Endocrinologists, American College of Endocrinology, and Androgen Excess and PCOS Society Disease State Clinical Review: Guide to the Best Practices in the Evaluation and Treatment of Polycystic Ovary Syndrome- Part 1. Endocr Pract. 2015;21(11):1291-300.
26. DeUgarte CM, Bartolucci AA, Azziz R. Prevalence of insulin resistance in the polycystic ovary syndrome using the homeostasis model assessment. Fertil Steril. 2005;83(5):1454-60.
27. Goodarzi MO, Dumesic DA, Chazenbalk G, Azziz R. Polycystic ovary syndrome: etiology, pathogenesis and diagnosis. Nat Rev Endocrinol. 2011;7(4):219-31.
28. Boomsma CM, Eijkemans MJ, Hughes EG, Visser GH, Fauser BC, Macklon NS. A meta-analysis of pregnancy outcomes in women with polycystic ovary syndrome. Hum Reprod Update. 2006;12(6):673-83.
29. Kicińska AM, Maksym RB, Zabielska-Kaczorowska MA, Stachowska A, Babińska A. Immunological and metabolic causes of infertility in polycystic ovary syndrome. Biomedicines. 2023;11(6):1567.
30. March WA, Moore VM, Willson KJ, Phillips DIW, Norman RJ, Davies MJ. The prevalence of polycystic ovary syndrome in a community sample assessed under contrasting diagnostic criteria. Hum Reprod. 2010;25(2):544-51.
31. Monastra G, Vazquez-Levin M, Bezerra Espinola MS, Bilotta G, Laganà AS, Unfer V. D-chiro-inositol,

an aromatase down-modulator, increases androgens and reduces estrogens in male volunteers: a pilot study. Basic Clin Androl. 2021;31(1):13.
32. Nordio M, Basciani S, Camajani E. The 40:1 myo-inositol/D-chiro-inositol plasma ratio is able to restore ovulation in PCOS patients: comparison with other ratios. Eur Rev Med Pharmacol Sci. 2019;23(12):5512-21.
33. Pustotina O, Myers SH, Unfer V, Rasulova I. The effects of myo-inositol and d-chiro-inositol in a ratio 40:1 on hormonal and metabolic profile in women with polycystic ovary syndrome classified as phenotype A by the Rotterdam Criteria and EMS-Type 1 by the EGOI Criteria. Gynecol Obstet Investig. 2024;89(2):131-9.
34. Kalra B, Kalra S, Sharma JB. The inositols and polycystic ovary syndrome. Indian J Endocrinol Metab. 2016;20(5):720-4.
35. Benelli E, Del Ghianda S, Di Cosmo C, Tonacchera M. A Combined therapy with myo-inositol and D-chiro-inositol improves endocrine parameters and insulin resistance in PCOS young overweight women. Int J Endocrinol. 2016;2016:3204083.
36. Colazingari S, Treglia M, Najjar R, Bevilacqua A. The combined therapy myo-inositol plus D-chiro-inositol, rather than D-chiro-inositol, is able to improve IVF outcomes: results from a randomized controlled trial. Arch Gynecol Obstet. 2013;288(6):1405-11.
37. Mohammadi S, Eini F, Bazarganipour F, Taghavi SA, Kutenaee MA. The effect of myo-inositol on fertility rates in poor ovarian responder in women undergoing assisted reproductive technique: a randomized clinical trial. Reprod Biol Endocrinol. 2021;19:61.
38. Zheng X, Lin D, Zhang Y, Lin Y, Song J, Li S, et al. Inositol supplement improves clinical pregnancy rate in infertile women undergoing ovulation induction for ICSI or IVF-ET. Medicine. 2017;96(49):e8842.
39. Merviel P, James P, Bouée S, Le Guillou M, Rince C, Nachtergaele C, et al. Impact of myo-inositol treatment in women with polycystic ovary syndrome in assisted reproductive technologies. Reprod Health. 2021;18(1):13.
40. Mendoza N, Diaz-Ropero MP, Aragon M, Maldonado V, Llaneza P, Lorente J, et al. Comparison of the effect of two combinations of myo-inositol and D-chiro-inositol in women with polycystic ovary syndrome undergoing ICSI: a randomized controlled trial. Gynecol Endocrinol. 2019;35(8):695-700.

Cite this article as: Manjula S, Kumar KM. Clinicians' perspectives on nutritional supplementation and polycystic ovary syndrome management in women in Indian settings. Int J Reprod Contracept Obstet Gynecol 2024;13:3268-74.