

Health and Nutrition Problems Among Women in Kerala: A Review

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ABSTRACT

Health and nutrition challenges among women vary significantly across life stages, from menarche to menopause, influenced by socio-economic and lifestyle factors. Kerala, in particular, faces a high incidence of early menarche (56% of girls between 10 and 12 years), which recent studies suggest may increase the risk of early menopause and associated health concerns due to alterations in circulating hormones. This review article synthesizes current evidence on the multifaceted health and nutritional challenges affecting women in Kerala across life stages-adolescence, reproductive years, menopause, and post-menopause. Nutritional deficiencies, such as Iron Deficiency Anemia (IDA), remain a major concern, especially among vulnerable groups like tribal populations, despite interventions like the Weekly Iron Folic Acid Supplementation initiative. Concurrently, the rising prevalence of obesity-driven by sedentary lifestyles and nutrition transition has contributed to increasing rates of metabolic syndrome, particularly among urban and postmenopausal women. Reproductive health issues, including menstrual distress, Polycystic Ovarian Syndrome (PCOS), and menopause-related conditions, further compound women's health issues, significantly impacting their quality of life. The review also examines trends in health and nutrition indicators over time, using comparative analyses of NFHS-4 and NFHS-5 data, to highlight the transition in women's health status. In conclusion, the findings underscore the urgent need for targeted health policies, culturally sensitive interventions, and public health strategies to address these challenges, aiming to improve the overall well-being of women in Kerala.

Keywords: Anemia, PCOS, NFHS, Overweight, Metabolic syndrome.

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INTRODUCTION

Global trends indicate a significant decrease in the average age of menarche, now approximately 12-13 years in high-income countries, attributed to improved nutrition and healthcare.^[1] However, in low- and middle-income countries, the age remains slightly higher at 13-15 years due to socio-economic factors. Early menarche, particularly before age 11, has been linked to increased risks of obesity, cardiovascular disease, type 2 diabetes, and breast cancer later in life.^[2] Additionally, women who experience early menarche face an 80% higher risk of premature and early menopause, which can exacerbate long-term health challenges.^[3] Postmenopausal women frequently experience weight gain due to metabolic changes, heightening their vulnerability to type 2 diabetes and cardiovascular disease.

Over recent decades, the age of menarche among Indian adolescents has decreased from 15.5 to 12.5 years which has further reduced to 10-11 years. This is influenced by socio-economic variables, with girls from wealthier families tending to reach menarche earlier.^[4] Early menarche in these populations increases exposure to circulating endogenous hormones, thereby elevating risks for adverse health outcomes, including emotional and mental health issues, reproductive challenges, and metabolic and cardiovascular conditions.^[5]

In Kerala, approximately 56% of girls experience early menarche (10-12 years), presenting a significant risk factor for various health issues. Urban women in Kerala are increasingly experiencing early menopause due to sedentary lifestyles, while rural women generally reach menopause later.^[6] These findings highlight the importance of targeted interventions in nutrition, lifestyle modifications, and preventive healthcare, especially in regions with diverse socio-economic backgrounds. This review focuses on understanding and addressing health and nutritional challenges across different age groups in Kerala.



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METHODOLOGY

This review work is based on a systematic organization of published literature involving research pertaining to women in the age group between 12 and 55 years from the state of Kerala, India. The purpose of this review paper is to generalize, summarise and analyse the health and nutritional status of adolescents and women in Kerala. Women across adolescence, reproductive years, menopause, and post-menopause were the population under study was the primary criteria of selection. The databases used for the systematic review collection were PubMed and Google Scholar. The first part of the review involves the identification of different health and nutritional problems among women in Kerala. The most common health issues were used as keywords in the literature search. The use of keywords were “prevalence AND anemia AND women AND Kerala”, prevalence AND polycystic ovarian syndrome AND women AND Kerala”, “prevalence AND menstrual distress AND women and Kerala” and “prevalence AND metabolic syndrome AND women AND Kerala”. In the second part, comparisons on health and nutritional problems of women in Kerala were drawn between NFHS-4 and NFHS-5 reports to gain insights pertaining to transitions over the years. Studies were included if they examined the prevalence of health and nutritional problems among women in Kerala. Key health issues identified for this review were anemia, Polycystic Ovarian Syndrome (PCOS), overweight and obesity, menstrual distress, and metabolic syndrome. Only studies conducted in Kerala and published in English were considered. Many studies were excluded as they did not meet the criterion process. Exclusion criteria included studies outside the defined age range or population, non-primary research (e.g., editorials, commentaries), and studies with incomplete or unclear data. Furthermore, searches were limited to work published in last 10 years i.e., from 2014 to 2024 to ensure the relevance of findings. A total of 36 studies were considered for the common health issue

RESULTS

Identification of health and nutritional problems among women in Kerala.

Anemia

A review paper done collected population-based studies on anemia among children, adolescents and women in Kerala from January 1st, 1990 till December 31st, 2015.^[7] Overall, it was found that the prevalence among adolescents was 30%. However, the prevalence of anemia among tribals was high and it ranged between 78.3 and 96.5% among women and children. Table 1 shows the studies on the prevalence and risk factors of anemia among women in Kerala.

From Table 1, it is evident that anemia prevalence is high in Kerala, however it remains below the national average. Kerala launched the Weekly Iron Folic acid Supplementation

(WIFS) program in 2013, which encountered difficulties due to non-compliance among the beneficiaries.^[15] This underscores the need of broad knowledge and nutritional education in addressing anemia within the state. The study had noted that the participants consumed low iron rich foods and some of them took tea and coffee which correlated strongly with their iron status.

Metabolic syndrome

Metabolic Syndrome (MetS) encompasses a collection of metabolic abnormalities, including hypertension, insulin resistance, visceral obesity, fatty liver, and atherogenic cardiovascular problems.^[16] Increasing rates of obesity in Kerala has contributed to the drastic increase in metabolic syndrome.^[17] Table 2 highlights studies conducted among women in Kerala, providing valuable insights into the prevalence, determinants, and associated health conditions.

Table 2 indicates MetS among women in Kerala as a pressing public health concern. Key findings reveal that urban women and those with obesity exhibit a markedly higher risk of developing MetS, with obesity increasing the risk by 3-7 fold. Certain population groups, such as postmenopausal women show distinct vulnerability to MetS.

Menstrual distress

In Kerala, cultural, socioeconomic, and lifestyle factors contribute to diverse menstrual health challenges, ranging from dysmenorrhea and Premenstrual Syndrome (PMS) in adolescents to menopause-related issues in middle-aged women.^[25] Table 3 shows the studies which highlights the menstrual health and associated conditions that has significantly impacted the physical, psychological, and social well-being of women across various age groups.

Table 3 also shows that the average age of menopause in Kerala is consistent across studies, ranging from 48.38 to 48.79 years, aligning with other Asian populations. Commonly reported symptoms include somatic issues (73%) such as joint pain and lethargy, along with psychological distress (48.5%) like mood swings, while vasomotor symptoms like hot flashes are less frequent compared to Caucasian populations. Quality of Life (QOL) is significantly impacted, with education, socioeconomic status, and marital status identified as key influencing factors. Risk factors for increased symptom prevalence include early menopause, comorbidities, and a lack of awareness about management options.

Polycystic Ovarian Syndrome

Polycystic Ovary Syndrome (PCOS) is a multifaceted condition affecting women of reproductive age, characterized by hormonal imbalances, metabolic disturbances, and psychosocial challenges.^[35] It has become increasingly prevalent, necessitating a comprehensive understanding of its risk factors, clinical

manifestations, and management strategies. Table 3 consolidates findings from various studies conducted in Kerala, providing insights into the dietary, clinical, and psychosocial dimensions of PCOS.

There are limited studies on the prevalence of PCOS in Kerala. The total percentage of adolescent girls is 7%, whereas the percentage prevalence of PCOS is 15% in Kerala.^[41] From Table 3, it is evident that dietary patterns, physical activity, and genetic predisposition emerge as key contributors to PCOS prevalence and severity.

Comparison of general health, social and nutritional problems between NFHS-4 and NFHS-5 data among women at both state and national level.

The National Family Health Survey (NFHS) is a large-scale survey conducted in India to collect data on health, nutrition, and family welfare indicators. Comparing data from NFHS-4 (2015-2016) and NFHS-5 (2019-2021) of Kerala provides valuable insights into the trends of social issues, general health and nutritional problems among women. Based on NFHS-4 and NFHS-5 data, a

Table 1: Studies on the prevalence and risk factors of anemia among women in Kerala.

Sl. No.	Objective	Sample/Population	Key Findings
1	Prevalence of anemia among adolescents	257 adolescent girls, Ettumanoor, Kottayam	21% prevalence of mild/moderate anemia. Recommendation: WIFS and biannual deworming. ^[8]
2	Prevalence of anemia among girls	1300 students (10-15 years), Ambalapuzha	53.5% prevalence; hemoglobin measured using cyanmethemoglobin method. ^[9]
3	Prevalence of anemia and associated factors	880 school children (11-15 years), Ernakulam	44% prevalence; poor iron-rich food intake and tea/coffee with meals linked to anemia severity. ^[7]
5	Prevalence of anemia among tribal women	347 tribal women (15-45 years), Wayanad	High prevalence; mild (30.5%), moderate (55.9%), severe anemia (10.1%). ^[10]
6	Prevalence of anemia and determinants among undergraduates	183 female undergraduates, Kottayam	19.3% prevalence; predictors: pallor, menstrual flow duration. ^[11]
7	Prevalence of anemia among tribal women	445 women, Karadukka Block Panchayat	Moderate (62%) and severe anemia (11%). ^[12]
8	Prevalence of anemia among pregnant women	295 pregnant women, Kozhikode	40% prevalence; moderate (30.5%) and severe (9.5%) anemia. ^[13]
9	Prevalence and risk factors among tribal women	200 tribal women, Kannavam area	High prevalence; moderate (14.2%), mild (49.6%). Factors: age >40, low income, menorrhagia. ^[14]

Table 2: Studies on the prevalence and risk factors of MetS among women in Kerala.

Sl. No.	Objective	Sample/Population	Key Findings
1	Evaluate presence and risk factors of MetS	Rural and urban women, Kerala	Prevalence higher in women (28% vs. 20% in men); Urban women more prone; Obesity increases MetS risk 3-7 fold. ^[18]
2	Prevalence of MetS in newly diagnosed diabetics	Diabetic patients, Thrissur	MetS prevalence 66.2%; higher in females (78.6%) with mean age 50 years. ^[19]
3	Prevalence of MetS in hospital-based women	Adult women (20-60 years), Kochi	MetS prevalence 67.8%. Emphasis on rising MetS trends in Kochi population. ^[20]
4	Prevalence and risk factors of MetS in tribal women	Tribal women, Kannur	MetS prevalence 32.5%; significantly high in tribal women. ^[21]
5	MetS among female patients in a referral hospital	Female patients (20-80 years), Central Kerala	Prevalence 47.5%; highest among ages 61-80 years, decreased with age. ^[22]
6	Thyroid dysfunction and MetS	Female MetS patients, Alappuzha	No significant relationship between thyroid dysfunction and MetS components. ^[23]
7	Association of Vitamin D status with MetS	Postmenopausal women, Kerala	Significant Vitamin D deficiency correlated with MetS in postmenopausal women. ^[24]

Table 3: Studies to assess the prevalence and risk factors of menstrual distress problems or PCOS among adolescents, college going students and middle-aged women in Kerala.

Sl. No.	Objective	Sample/Population	Key Findings
1	Menstrual problems among school students	510 adolescent girls, Thiruvananthapuram	Common issues: dysmenorrhea, menorrhagia, irregular periods. 14.7% reported academic challenges due to the same. ^[26]
2	Menstrual irregularities and risk factors	Adolescent girls, Amrita College of Nursing	Dysmenorrhea (26.4%) and oligomenorrhea (14.9%) common. ^[27]
3	Prevalence and predictors of PMS and dysmenorrhea	Adolescent girls and medical college students in Kerala	PMS incidence high. ^[28] PMS/PMDD negatively impacted academics and well-being. Predicted by age, dysmenorrhea, and family history. ^[29] Dysmenorrhea prevalence was high. Back pain most frequent physical symptom. ^[30]
4	Prevalence of climacteric symptoms and associated factors	Women (40-60 years), Nellanad Panchayat	Average menopause age: 48.79 years. Somatic (73%) and psychological (48.5%) symptoms common; lower vasomotor symptoms compared to Caucasians. ^[31]
5	Menopause-related symptoms and quality of life	Postmenopausal women, Amrita Institute of Medical Sciences	Physical symptoms common post-menopause; QOL linked to education, socioeconomic, and marital status. Nursing education needed to improve awareness. ^[32]
6	Prevalence of postmenopausal symptoms	Rural women, Kozhikode	Lower prevalence compared to similar studies. Early menopause and comorbidities increased risk. Calcium supplements reduced symptom prevalence. ^[33]
7	Reproductive factors influencing menopause	Married women, rural and urban Kerala	Mean menopause age: 48.38 years. Menstrual issues, contraceptive use linked to age. No socioeconomic differences observed. ^[34]
8	Assessment of dietary, clinical, and biochemical parameters of PCOS women.	40 PCOS women and 40 non-PCOS women attending gynecology departments in Kerala.	Increased calorie consumption leads to obesity and hormonal imbalances. Early interventions during adolescence can prevent complications later in life. ^[36]
9	Determine the risk factors of PCOS	Women diagnosed with PCOS at Karuna Medical College Hospital.	Risk factors include family history, lack of exercise, stress, and a high-carb diet. ^[37]
10	Evaluate PCOS among pharmacy students.	Pharmacy students at Ezhuthachan College of Pharmaceutical Sciences, Trivandrum.	Weight reduction through structured diets and physical activity improves reproductive and metabolic health in PCOS. ^[38]
11	Psychosocial challenges of PCOS in reproductive-age women.	Reproductive-age women in Kollam district, Kerala.	Addressing mental health and body image issues is essential for successful behavioral interventions in PCOS management. ^[39]
12	Relationship between obesity, visceral adiposity, and PCOS.	Women of childbearing age in Thrissur district, Kerala.	BMI is a significant risk factor for PCOS; waist-to-hip ratio is not. Weight management is key to effective PCOS management. ^[40]

comparison is given between the prevalence rates between Kerala and India and is given in Table 4.

From the table, it can be observed that Kerala outperforms the national average in most maternal and child health indicators. Kerala shows significant progress in reducing teenage

pregnancies and child marriages compared to the national average. Gender-based violence prevalence is lower in Kerala compared to the national figures and shows a reduction over time. The prevalence of anemia has increased in Kerala but remains lower than the national average. Kerala initiated WIFS

Table 4: Prevalence rates of general health, social and nutritional problems and comparison between NFHS-4 and NFHS-5.

	Prevalence rate in Kerala		Prevalence rate at National level	
	NFHS-4	NFHS-5	NFHS-4	NFHS-5
Prevalence of gender-based violence among married women (18-49 years)	14.3	9.9	31.2	29.3
Total fertility rate	1.6%	1.8%	2.2%	2%
Prevalence of teenage pregnancy	3%	2.4%	7.9%	6.8%
Mothers who had an antenatal check-up in the first trimester	95.1%	93.6%	58.6%	70%
Mothers who had at least 4 antenatal care visits	90.1%	78.6%	51.2%	58.1%
Mothers whose last birth was protected against neonatal tetanus	96.4%	95.2%	89%	92%
Health facility births	99.8	99.8	78.9	88.6
Initial breast-feeding practices	64.3	66.7	41.6%	41.6
Exclusive breastfeeding	53.3	55.5	54.9	63.7
Women whose BMI is <18.5 kg/m ² between 15 and 49 years	19.3	20.1	42.2	34.4
Women whose BMI is ≥25 kg/m ² between 15 and 49 years	65	76.4	46.3	52.9
Anemia among pregnant women between 15 and 49 years	22.6	31.4	50.4	52.2
Anemia among women aged between 15 and 49 years	34.3	36.3	53.1	57
Prevalence with high blood glucose values (>140 mg/dL) among women aged between 15 to 49 years	17.4	16.6	12.1	12.6
Prevalence with very high blood glucose values (>160 mg/dL) among women aged between 15 and 49 years	9.6	26.1	5.9	13.5
Mildly elevated blood pressure (systolic of 140-159 mm of Hg and diastolic of 90-99 mm of Hg) among women aged between 15 and 49 years	10.9	30.9	13.8	25.5
Moderately elevated blood pressure (systolic of 160-179 mm of Hg and diastolic of 100-109 mm of Hg) among women aged between 15 and 49 years	1.6	13.2	2.9	10.4

Source: Adapted from NFHS-4 (2017), NFHS-5 (2021).^[42-45]

(Weekly Iron Folic Acid Supplementation) program in 2013, which suffered setback due to the non-compliance from the part of beneficiaries.^[7] This makes general awareness and nutrition education important to tackle anemia in the state.

It can also be noted that the emerging issues like obesity, hypertension, and high blood glucose require urgent attention. Kerala faces sharp increases in hypertension and severe blood glucose issues, signaling lifestyle-related health risks. Nationally, these conditions are increasing at a slower pace. Kerala shows a dual burden of malnutrition, with rising obesity alongside persistent undernutrition and anemia, reflecting dietary imbalances and lifestyle changes. At the national level, undernutrition is improving, but anemia and obesity are growing challenges, indicating that while caloric intake may be improving, diet quality and lifestyle factors need more attention. The obesity problem among women in Kerala appears to be the greatest challenge and it is much higher than the national average. This is also reflected in high waist-hip ratio (≥ 0.85) (%) which was

observed to be 71.1% for urban and 70.2% for rural population as per NFHS-5 data which is much higher than the national average (59.9% for urban and 55.2 % for rural population).

A study has identified the increased risk of endogenous circulating hormones with early menarche leading to early menopause.^[5] The reason behind the increasing prevalence of lifestyle diseases can also be attributed to early menarchal age leading to early menopause which has become the current trend for the majority in Kerala.

CONCLUSION

The health of women during their reproductive years is significant not only for the women themselves but also influences the health and development of future generations. The health and nutritional status of women in Kerala present a complex interplay of persistent challenges and emerging concerns. Despite significant advancements in healthcare, issues such as anemia, obesity, metabolic disorders, and reproductive health problems

remain prominent, particularly among specific subgroups like the tribal population and postmenopausal women. These conditions not only impact women's physical health but also their overall quality of life, emphasizing the need for targeted, context-specific interventions. The findings from this review underscore the importance of comprehensive health policies that address both the immediate nutritional needs and the broader lifestyle factors influencing women's health. Further research and community-based initiatives are essential to tailor interventions that can effectively combat these issues, improve health outcomes, and empower women across all stages of life in Kerala.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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ABBREVIATIONS

IAD: Iron Deficiency Anemia; **PCOs:** Polycystic Ovarian Syndrome; **Mets:** Metabolic Syndrome; **NFHS:** National Family Health Survey.

SUMMARY

This review details the diverse health and nutrition problems faced by women in Kerala across different life stages from adolescent age to post-menopause. It highlights the high prevalence of early menarche, which may lead to early menopause and related health issues. Key concerns include widespread iron deficiency anemia, particularly among tribal communities, and the growing burden of obesity and metabolic syndrome due to lifestyle changes. Reproductive health problems like menstrual distress, PCOS and menopause-related conditions are also prevalent and it impacts women's quality of life. The review analyzes trends using NFHS-4 and NFHS-5 data, emphasizing the need for targeted, culturally appropriate health policies and public health strategies to improve women's well-being in Kerala.

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