INSTITUTIONAL HUMAN ETHICS COMMITTEE

Avinashilingam

Institute for Home Science and Higher Education for Women
(Deemed to be university under Category'A' by MHRD, Estd.u/s3 of UGC Act 1956) Re-accredited with 'A^{++}' Grade by NAAC.
Recognised by UGC Under Section 12 B
Coimbatore-641043,TamilNadu,India

Date: 12-04-2024

To
Jolly TT
Department of Food Science and Nutrition
Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore – 641043

Dear Jolly TT

Ref: Your proposal No. IHEC/23-24/FSN-05/ 09-02-2024

The Institutional Human Ethics Committee of our University hereby grants approval to your research entitled 'Impact of Nutrition Interventions on Nutritional and Health Status of Young Adult Women (18-21 years) having PCOS in Thrissur, Kerala'. The Approval number for the same is AUW/IHEC/FSN/23-24/FHP-05.

We wish you all the best in your research endeavours.

Dr. A Thirumani Devi 12.4.24
Member Secretary

Institutional Human Ethics Committee

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(Affiliated to the University of Calicut & Nationally Re-accredited with A+ Grade - 4th Cycle)

10-07-2023

To

Jolly T T
Research Scholar
Avinashilingam Institute for Home Science and Higher Education for Women

Dear Jolly TT,

Ref: Your PhD work Proposal entitled "Impact of Nutrition Interventions on Nutritional and Health Status of Young Adult Women (18-21years) having PCOS in Thrissur, Kerala" submitted for approval of Research Ethics Committee of Vimala College (Autonomous), Thrissur on 21-06-2023.

The institutional Research Ethics Committee has evaluated and analyzed the proposal via oral presentations and interaction with the candidate in the offline mode on 28-06-2023 and hereby grants approval to your research proposal entitled "Impact of Nutrition Interventions on Nutritional and Health Status of Young Adult Women (18-21years) having PCOS in Thrissur, Kerala". The approval number for the same is VC/REC/23-24-1

We wish you all the best in your research endeavours

Regards

Dr Honey Sebastian

Member Secretary
Dr. HONEY SEBASTIAN
HOD
Department of Zoology
Vimala College (Autonomous)
Thrissur - 680 009
Kerala

VIMALA COLLEGE (AUTONOMOUS) Re-accredited by NAAC ... Grade ... on ... point ... 3rd Cycle THRISSUR-680 009

Clinical Trial Details (PDF Generation Date :- Mon, 29 Apr 2024 05:12:04 GMT)

CTRI Number	CTRI/2024/04/065879 [Registered on: 18/04/2024] - **Trial Registered Prospectively**
Last Modified On	18/04/2024
Post Graduate Thesis	Yes
Type of Trial	Interventional
Type of Study	Other (Specify) [Health Mix Powder]
Study Design	Randomized, Parallel Group Trial
Public Title of Study	Effectiveness of nutritional interventions on PCOS among Young adult women
Scientific Title of Study	Impact of nutrition Interventions on nutritional and health status of young adult women (18 -21 years) having PCOS in Thrissur, Kerala

Secondary IDs if Any

Secondary ID	Identifier
NIL	NIL

Details of Principal Investigator or overall Trial Coordinator (multi-center study)

Details of Principal Investigator	
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Details Contact Person (Scientific Query)

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Details Contact Person (Public Query)	
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QUESTIONNAIRE- PHASE 1

IMPACT OF NUTRITION INTERVENTIONS ON NUTRITIONAL AND HEALTH STATUS OF ADULT WOMEN (18-25 YEARS) HAVING PCOS IN THRISSUR

I. SOCIAL BACKGROUND

1. Name : **Phone No**:

2. Address **College& Department**

3. Age:

4. Religion: a) Hindu b) Muslim c) Christian d) Others

5. Marital Status a) Single b) Married

6. Type of Family a) Nuclear b) Joint

7. Family size a) 1-4 b) 5-8 c) >8

8. Educational Qualification a) Graduate b) Post Graduate c) Pursuing Graduate

9. Monthly Income a) <2400 b) 2401-7000 c) 7001-12000 d) 12001-18000 e) 18001-24000 f) 24001-48000 g) 48000<

10. Education of Head of the Family: a) Professional Degree b) Graduate c) Diploma d) High School e) Middle School f) Primary School g) Illiterate

11. Occupation of the head of Family a) Professional b) Semi professional c) Clerical/Shop/Farm d) Skilled worker e) Semi-Skilled worker f) Unskilled worker g) Unemployed

II. LIFESTYLE PATTERN FOLLOWED

12. Duration of sleep a) <4 hrs b) 4-6 hrs c) 6-8 hrs d) >8 hrs

13. Do you exercise regularly? a) Yes b) No

14. Time spent on exercise a) 30 min b) 1 hr c) >1 hr

15. Type of exercise a) Brisk walking b) Yoga c) Meditation d) Jogging e) Aerobics f) No exercise

16. Time of exercise a) Morning b) Evening

III. ANTHROPOMETRIC DETAILS

17. Height:

18. Weight:

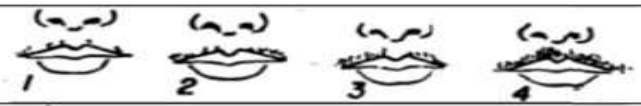
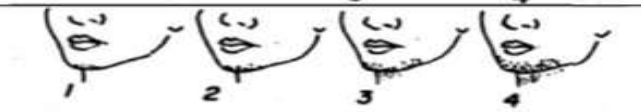
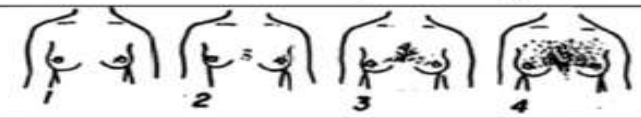
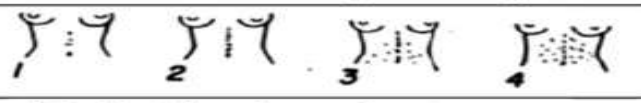
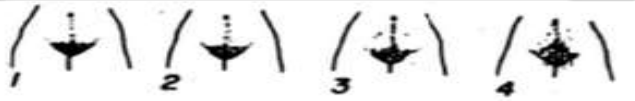
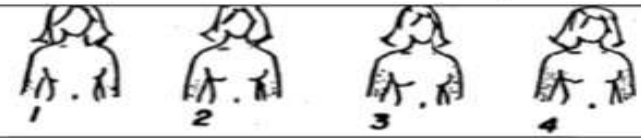
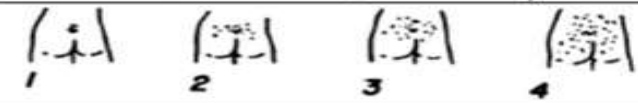
19. Waist circumference:

20. Hip circumference :

21. BMI:

22. W/H Ratio:

IV. HIRSUTISM SCORING SHEET

Body Area	Date of exam :		
Upper Lip		Score	
Chin		Score	
Chest		Score	
Upper Abdomen		Score	
Lower Abdomen		Score	
Arms		Score	
Thigh		Score	
Upper Back		Score	
Lower Back		Score	
		TOTAL SCORE	

V. RISK ASSESSMENT

Age at Menarche:

S. No	Questions	Never	Rarely	Some time	Usually
1	Do you have irregular periods?				
2	Do you miss your period in your regular cycle?				
3	Do you get your menstrual cycle for more than 35 days?				
4	Do you have your menstrual flow for more than five days?				
5	Are you changing more than 4 pads per day?				
6	Do you experience Nausea/vomiting during menstruation?				
7	Do you experience abdominal pain during menstruation?				
8	Do you experience Pain/tenderness in the breast during menstruation?				
9	Do you have heavy menstrual flow with clots?				
10	Do you have pimples on your face?				
11	Do you have hair fall?				
12	Do you have a problem with hair growth over the chest, face or abdomen				
13	Do you have any darkening and thickening of skin folds around the neck and axillae				
14	Do you have the habit of eating junk food?				
15	Do you have weight gain?				
16	Do you have difficulty losing weight?				
17	Do you have frequent thirst and urination?				
18	Do you feel extremely hungry, irritable and sleepy?				
19	Do you have symptoms of giddiness and fatigue				
20	Do you have a stressful and depressive mind?				

Are you ready for giving a blood sample for testing? Yes/ No

VI. FOOD HABITS AND DIETARY PATTERN

1. **Types of the dietary pattern followed by the subject** — a) vegetarian b) Non-veg c) Ovo-veg d) Lacto-veg
2. **How many meals do you have per day?** — a) 2 full meals only b) 3 full meals only c) 3 meals & 1 snack d) More than 3 meals
3. **Do you have the habit of skipping meals?** — a) Yes b) No

   If yes, Specify — a) Breakfast b) Lunch c) Dinner
4. **Reason for skipping meals** — a) Lack of appetite b) Dislike to foods c) Lack of time d) unavailability
5. **Do you have the habit of eating outside?** — a) Yes b) No

   If Yes, — a) Daily b) Once in 2 days c) Once a week d) Once a month e) Never
6. **The taste preference of the subject is** — a) Sweet b) Salty c) Spicy d) Cold e) Hot f) Fried
7. **Do you have a food allergy?** — a) Yes b) No
8. **What calories and fat-dense foods do you eat and how frequently?**

Food Items	Daily	Weekly	Monthly	Yearly	Never
Fried snacks					
Non-veg snacks					
Carbonated drinks					
Sweet items					
Bakery items					

9. FOOD FREQUENCY TABLE

FOOD GROUP	DAILY (A)	ALTERNATIVELY (B)	ONCE IN A WEEK (C)	OCCASIONALLY (D)	NEVER (E)
Cereals					
Pulses					
Green Leafy Vegetables					
Other Veg					
Roots & Tubers					
Fruits					
Milk & Milk Products					
Fish, Meat & Egg					
Fats & Oils					
Sugars					

10. 24 HOUR RECALL

TIME	ITEM	AMOUNT
Morning		
Mid-morning		
Lunch		
Evening		
Night		

11. RECORDING BEVERAGE INTAKE

	HOW OFTEN (MARK ONE)							HOW MUCH EACH TIME (MARK ONE)				
Type of Beverage	Never or less than 1 time per week	1 time per week	2-3 times per week	4-6 times per week	1 time per day	2+ times per day	3+ times per day	Less than (3/4 cup)	1cup	1 /2cups	2 cups	More than 2 ½ cups)
Water												
100% Fruit Juice												
Sweetened Juice Beverage/Drink (fruit ades. lemonade, punch, Sunny Delight')												
100% Vegetable juice												
Whole Milk												
Reduced Fat Milk (2%)												
Low Fat/Fat-Free Milk (Skim, 1%, Buttermilk, Soymk)												
Soft Drinks, Regular												
Coffee, with cream and/or sugar (includes non-dairy creamer)												
Tea or Coffee, black, with/ without artificial sweetener (no cream or sugar)												
Beer, Wine Coolers												
Wine (red or white)												
Meal Replacement Shakes/Protein Drinks Slim fast• .shakes, etc)												
Energy Drinks (Red Bull'. Rockstar', Full Throttle•.etc.)												

12. CHECKLIST FOR ASSESSING THE NUTRITIONAL PROBLEMS

PHYSICAL SIGNS	YES	NO
ANAEMIA		
Dizziness and fatigue after physical activity		
Pale nails		
Frequent minor infections		
Shortness of breath		
Headache		
Angular stomatitis		
OBESITY		
Breathlessness		
Increased sweating		
Snoring		
Difficulty doing physical activity		
Often feeling tired		
Joint and back pain		
UNDERWEIGHT		
Fatigue and lethargy		
Low heart rate		
Night sweats		
Having cold fingers and toes		
Muscle problems		
Nausea		
OSTEOPOROSIS		
Change in posture		
Shortness of Breath		
Frequent Bone fracture		
Pain in the lower back		
Receding gums		
Weaker grip strength		
PREDIABETES		
Increased Thirst		
Frequent Urination		
Increased hunger		
Fatigue		
Unintended weight loss		
Blurry vision		

13. MEDICAL HISTORY

Please Tick if you have any of these conditions	**Yes**	**No**
Heart Disease		
Seizures		
Migraines		
Alcoholism		
Drug Addiction		
Depression		
Osteoporosis/Osteopenia		
Arthritis		
Diabetes		
Lung Disease		
HIV/AIDS		
Irritable Bowel Syndrome		
Kidney disease/problems		
Thyroid Disease/problems		
Cancer		

14. GYNECOLOGICAL PROBLEMS

Have you ever had or do you now have any of the following	**Yes**	**No**
Uterus/ Cervix/ Ovary Cancer		
Recurrent vaginal infections		
Ovarian cysts		
Fibroids of uterus		
Premenstrual syndrome		

15. FAMILY HISTORY ***Indicate which (if any) of your family members have had the following:***								
	Mother	**Father**	**Any Sister**	**Any Brother**	**Mother's Mother**	**Mother's Father**	**Father's Mother**	**Father's Father**
Breast Cancer								
Uterus/Ovary Cancer								
Colon Cancer								
Diabetes								
Heart Disease								
High Blood Pressure								
Psychiatric Problems								
Stroke/Blood Clots								
Osteoporosis								

Knowledge and Attitude Assessment

1. Did you hear about the Ovarian Cyst before? Yes No
2. Source of knowledge? Friends Mass media
3. Do you know about the problems of the disease? Yes No
4. What are these problems? Delay of Pregnancy Menstrual problems
5. Do you know about the methods of treatment? Yes No
6. What treatment methods do you know? Weight reduction Ovarian Cystectomy
   Injectables Others
7. Are you familiar with these symptoms of PCOS?

Irregular menstrual cycle	Yes	No
Facial acne	Yes	No
Hirsutism	Yes	No
Reduce fertility	Yes	No
Weight gain	Yes	No
Frontal hair loss	Yes	No
Pelvic pain	Yes	No
Abortion	Yes	No
Early puberty	Yes	No
Diabetes	Yes	No
Hypertension	Yes	No
Psychological disturbances	Yes	No

8. In your opinion is weight reduction effective in treatment? Yes No
9. If yes, how weight reduction improves PCOS?
   Improve ovulation Improve psychological condition
   Both Others
10. If not, why not be effective? Not useful Side effects
    Both Others
11. In your opinion is diet management effective in treatment? Yes No
12. If yes, how Diet management improves reproductive health?
    Improve ovulation Reduce symptoms
    Both Others
13. If not, why not be effective? Not useful Side effects
    Both Others
14. In your opinion is physical activity effective in treatment? Yes No
15. If yes, how does physical activity minimize the consequences of PCOS?
    Improve ovulation Reduce symptoms
    Both Others
16. If not, why not be effective? Not useful Side effects
    Both Others

IMPACT OF NUTRITION INTERVENTIONS ON NUTRITIONAL AND HEALTH STATUS OF ADULT WOMEN (18-21 YEARS) HAVING PCOS IN THRISSUR, KERALA

PHASE 2

Name: ……Year- 1/2/3 Dep …….. Group -1/2/3/4 , Hos/Day

Height: Weight: Waist: Hip:

1. ACNE GRADING

Location	Nil	Comedone	Papule	Pustule	Nodules
Forehead					
Right Cheek					
Left Cheek					
Nose					
Chin					
Chest and Upper Back					

2. SUN EXPOSURE

Do you expose to sunlight? Yes No

If yes, how many hours?

	I was not outside during this period	0-1 hour	1-2 hours	2-3 hours	3-4 hours
7 to 11 am					
11 am to 3 pm					
3 pm to 7 pm					

Do you work mostly indoors or outdoors?

(1) Only indoors
(2) Mostly indoors
(3) Equal amounts of indoor and outdoor
(4) Mostly outdoors
(5) Only outdoors

3. GODIN LEISURE – TIME EXERCISE QUESTIONNAIRE

Type of Exercise	Once a week	Twice a week	Thrice a week	Daily	Never
STRENUOUS EXERCISE					
Running					
Jogging					
Hockey/ Football/ Basketball					
Swimming					
Long distance cycling					
MODERATE EXERCISE					
Fast walking					
Tennis					
Easy bicycling					
Volleyball/badminton					
Folk dancing					
MILD/LIGHT EXERCISE					
Yoga					
Archery					
Fishing					
Horse Shoes					
Easy walking					

4. PERCEIVED STRESS SCALE

0 = Never 1 = Almost Never 2 = Sometimes 3 = Fairly Often 4 = Very Often

1. In the last month, how often have you been upset because of something that happened unexpectedly?	0	1	2	3	4
2. In the last month, how often have you felt that you were unable to control the important things in your life?	0	1	2	3	4
3. How often have you felt nervous and "stressed" in the last month?	0	1	2	3	4
4. In the last month, how often have you felt confident about your ability to handle your personal problems?	0	1	2	3	4
5. In the last month, how often have you felt that things were going your way?	0	1	2	3	4
6. In the last month, how often have you found that you could not cope with all the things that you had to do?	0	1	2	3	4
7. In the last month, how often have you been able to control irritations in your life?	0	1	2	3	4
8. In the last month, how often have you felt that you were on top of things?	0	1	2	3	4
9. In the last month, how often have you been angered because of things that were outside of your control?	0	1	2	3	4
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	0	1	2	3	4

5. 24-hour Recall

TIME	ITEM	AMOUNT
Morning		
Mid-morning		
Lunch		
Evening		
Night		

Polycystic Ovary Syndrome Questionnaire
Self-administered

To what extent have you felt that growth of visible hair on your chin has been a problem for you during the last two weeks:

	A Severe Problem	A Major Problem	A Moderate Problem	Some Problem	A Little Problem	Hardly any Problem	No Problem
1. Growth of visible hair on chin?	☐	☐	☐	☐	☐	☐	☐

During the past two weeks, how much of the time have you felt:

	All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	Hardly any of the Time	None of the Time
2.Depressed as a result of having PCOS?	☐	☐	☐	☐	☐	☐	☐
3. Concerned about being overweight?	☐	☐	☐	☐	☐	☐	☐
4. Easily tired?	☐	☐	☐	☐	☐	☐	☐
5.Concerned with infertility problems?	☐	☐	☐	☐	☐	☐	☐
6.Moody as a result of having PCOS	☐	☐	☐	☐	☐	☐	☐

In relation to you last menstruation, how much were the following issues a problem for you:

	A Severe Problem	A Major Problem	A Moderate Problem	Some Problem	A Little Problem	Hardly any Problem	No Problem
7.Headaches?	☐	☐	☐	☐	☐	☐	☐
8.Irregular menstrual periods?	☐	☐	☐	☐	☐	☐	☐

To what extent has growth of visible hair on your upper lip been a problem for you during the last two weeks:

	A Severe Problem	A Major Problem	A Moderate Problem	Some Problem	A Little Problem	Hardly any Problem	No Problem
9.Growth of visible hair on upper lip?	☐	☐	☐	☐	☐	☐	☐

During the past two weeks, how much of the time have you:

	All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	Hardly any of the Time	None of the Time
10.Had trouble dealing with your weight?	☐	☐	☐	☐	☐	☐	☐
11.Had low self-esteem as a result of having your PCOS?	☐	☐	☐	☐	☐	☐	☐
12.Felt frustration in trying to lose weight?	☐	☐	☐	☐	☐	☐	☐
13.Felt afraid of not being able to have children?	☐	☐	☐	☐	☐	☐	☐
14.Felt frightened of getting cancer?	☐	☐	☐	☐	☐	☐	☐

Over the last two weeks, to what extent the following issues have been a problem for you:

	A Severe Problem	A Major Problem	A Moderate Problem	Some Problem	A Little Problem	Hardly any Problem	No Problem
15.Growth of visible hair on your face?	☐	☐	☐	☐	☐	☐	☐
16. Embarrassment about excessive body hair?	☐	☐	☐	☐	☐	☐	☐

During the past two weeks how much of the time have you been:

	All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	Hardly any of the Time	None of the Time
17.Worried about having PCOS?	☐	☐	☐	☐	☐	☐	☐
18. Self-conscious as a result of having PCOS?	☐	☐	☐	☐	☐	☐	☐

In relation to your last menstruation, how much the following issues were a problem for you:

	A Severe Problem	A Major Problem	A Moderate Problem	Some Problem	A Little Problem	Hardly any Problem	No Problem
19.Abdominal Bloating?	☐	☐	☐	☐	☐	☐	☐
20.Late menstrual period?	☐	☐	☐	☐	☐	☐	☐
21.Menstrual cramps?	☐	☐	☐	☐	☐	☐	☐

How much of the time during the last two weeks did you:

	All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	Hardly any of the Time	None of the Time
22.Feel like you are not sexy because of being overweight?	☐	☐	☐	☐	☐	☐	☐
23. Feel a lack of control over the situation with PCOS?	☐	☐	☐	☐	☐	☐	☐
24. Have difficulties staying at your ideal weight?	☐	☐	☐	☐	☐	☐	☐
25.Feel sad because of infertility problems?	☐	☐	☐	☐	☐	☐	☐

To what extent has growth of visible body hair been a problem for you during the last two weeks:

	A Severe Problem	A Major Problem	A Moderate Problem	Some Problem	A Little Problem	Hardly any Problem	No Problem
26.Growth of visible body hair?	☐	☐	☐	☐	☐	☐	☐

QUESTIONNAIRE TO ASSESS KNOWLEDGE ON PCOS

Please read the following questions and tick the answer in the appropriate options

1. Where are the ovaries situated in the female reproductive system?
   a) Inside the uterus
   b) Each side of the uterus
   c) Below the uterus
   d) Above the uterus
2. How many ovaries are present in the female reproductive system?
   a) 2
   b) 4
   c) 1
   d) 3
3. What is the shape of the ovaries?
   a) Diamond
   b) Square
   c) Round
   d) Almond
4. What are the two types of cells present in the ovaries?
   a) Stroma cells and squamous cells
) Stratified cells and columnar cells
   c) Granulosa cells and theca cells
   d) Epithelial cells and endothelial cells
5. Which female hormones are produced by ovaries?
   a) Estrogen and progesterone
   b) Testosterone
   c) Prolactin
   d) Thyroid
6. What is a polycystic ovarian syndrome (PCOS)?
   a) Excessive androgen without enlarged polycystic ovaries
   b) Excessive androgen with hirsutism, amenorrhoea, obesity and enlarged polycystic ovaries
   c) Excessive thyroxin with amenorrhoea
   d) Excessive prolactin with obesity
7. Which age group of people are mostly affected by polycystic ovarian syndrome?
   a) Pre puberty
   b) Postmenopausal
   c) Adolescent
   d) Old age
8. Who are all at-risk people for developing polycystic ovarian syndrome?
   a) Family history of seizure
   b) Family history of diabetes
   c) Family history of cardiovascular disease
   d) Family history of night blindness
9. Which is the hormone responsible for developing polycystic ovarian syndrome?
   a) Thyroxin and estrogen
   b) Epinephrine and estrogen
   c) Estrogen and catecholamine
   d) Estrogen and testosterone
10. What is the cause of polycystic ovarian syndrome?
   a) Alteration in hypothalamus-pituitary function
   b) Alteration in thyroid function
   c) Alteration in renal function
   d) Alteration in the adrenal gland
11. What is hyperinsulinemia?
   a) Increased level of glucagon in the blood
   b) Increased level of thyroxin in the blood
   c) Increased level of insulin in the blood
   d) Increased level of adrenaline in the blood
12. Which enzyme is released by ovarian follicles due to hyperinsulinemia in polycystic ovarian syndrome?
   a) Peptidase
   b) Leptin
   c) Aromatase
   d) Peptin
13. Which enzyme is essential for converting androgen to estrogen?
   a) Glucagon
   b) Insulin
   c) Aromatase
   d) Leptin
14. Which is the protein essential to bind with testosterone and estrogen in blood?
   a) Sex hormone-binding globulin
   b) Somatic hormone binding globulin
   c) Estrogen hormone binding globulin
   d) Testosterone hormone binding globulin
15. How the hyperestrogenic (increased estrogen level) stage will occur?
   a) Increased aromatization of progesterone
   b) Increased aromatization of estrogen
   c) Increased aromatization of androgen
   d) Increased aromatization of prolactin
16. What is Hirsutism?

a) Excessive nail growth
b) Excessive hair growth
c) Excessive muscle growth
d) Excessive skin growth

17. Where is the location of Acanthosis Nigerians in polycystic ovarian syndrome?
a) Leg
b) Face
c) Neck
d) Eye

18. How many menstrual cycles occur in polycystic ovarian syndrome patients per year?
a) Less than 6 cycles per year
b) Less than 10 cycles per year
c) Less than 8 cycles per year
d) Less than 2 cycles per year

19. How to identify polycystic ovarian syndrome through a blood test?
a) Hemoglobin test
b) Liver function test
c) Renal function test
d) Hormone test

20. Which is the major diagnostic tool for polycystic ovarian syndrome?
a) Ultrasound of the abdomen
b) Echo
c) X-ray
d) Doppler scan

21. What is the first-line treatment for polycystic ovarian syndrome?
a) Surgery
b) Exercise
c) Diet and exercise
d) Medication

22. What type of diet should be taken for polycystic ovarian syndrome?
a) Fried food items
b) Fiber and protein-rich diet
c) Fat-rich diet
d) Carbohydrate-rich diet

23. What type of diet should be avoided for polycystic ovarian syndrome?
a) Fat
b) Protein
c) Unsaturated oils
d) Fiber

24. What is the salt requirement per day in polycystic ovarian syndrome patients?
a) Less than 2600 mg per day
b) Less than 2000 mg per day
c) Less than 2200 mg per day
d) Less than 2400 mg per day

25. What is to be used instead of salt in the dietary management of polycystic ovarian syndrome patients?
a) Iodine salt
b) Lemon
c) Honey
d) Sauces

26. What are the drugs used to correct irregular menstruation in polycystic ovarian syndrome?
a) Metformin
b) Contraceptive pills
c) Progesterone tablets
d) All the above

27. Which cream is used for unwanted hair growth in polycystic ovarian syndrome?
a) Progesterone
b) Flutamide
c) Eflorthine
d) Ranitidine

28. What are the drugs used to treat infertility in polycystic ovarian syndrome?
a) Clomifene, metformin, gonodotrphins
b) Clomifene with metformin
c) Clomifene
d) Gonadotrophins

29. What is the surgical treatment for polycystic ovarian syndrome?
a) Resection of the ovary
b) Hysterectomy
c) Thyroidectomy
d) Ovarian diathermy

30. What is the complication of polycystic ovarian syndrome?
a) Carcinoma in liver
b) Carcinoma in the uterus
c) Carcinoma in the abdomen
d) Carcinoma in the pelvis

SCORECARD

In front of you, there are three samples. Taste the samples and tick how much you like or dislike each of the characteristics.

Like a lot-1, like a little-2, neither like nor dislike-3, Dislike a little- 4, Dislike a lot- 5

	Appearance	**Aroma**	**Taste**	**Texture**	**Overall acceptance**
SAMPLE 1					
SAMPLE 2					
SAMPLE 3					

Name:

Department:

SCORECARD

In front of you, there are three samples. Taste the samples and tick how much you like or dislike each of the characteristics.

Like a lot-1, like a little-2, neither like nor dislike-3, Dislike a little- 4, Dislike a lot- 5

	Appearance	**Aroma**	**Taste**	**Texture**	**Overall acceptance**
SAMPLE 1					
SAMPLE 2					
SAMPLE 3					

Name:

Department:

Dol: https://doi.org/10.58537/jorangrau.2023.51.3.09

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RAGI HEALTH MIX FOR MANAGING POLYCYSTIC OVARIAN SYNDROME - FORMULATION AND NUTRIENT ANALYSIS

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ABSTRACT

Polycystic Ovarian Syndrome, the most common endocrine disorder affecting women of reproductive age, affects between 5–10% of women globally. All PCOS-affected women should engage in lifestyle interventions including diet and exercise since losing weight decreases PCOS symptoms. Because of their greater concentrations of phenolic compounds, fibre, flavonoids, and phytosterols, millets outperform other cereals in terms of nutrition, health advantages, and phytochemical makeup.This study was conducted in May 2023. In this study, aim was to develop and assess a ragi-based nutritional supplement, high in micronutrients and fibre, for women with PCOS. The supplement was prepared in clean, and sanitary conditions. A panel of 30 judges conducted the organoleptic tests. Standard techniques were used to evaluate microbial activity and nutrient content.The prepared health mix was statistically significant ($P< 0.05$). After five days, the microbiological tests revealed that it was microbe-free. The health mix was shown to be abundant in fibre and micronutrients after a nutritional analysis. The results showed that the ragi supplement may be used to manage PCOS.

Key Words: Nutrient Analysis, PCOS, Ragi, Sensory Evaluation, Supplement

INTRODUCTION

About 5–10% of women worldwide are affected by PCOS, a prevalent endocrine condition in women at reproductive age. Numerous metabolic complications, including obesity, hyperlipidemia, hyperinsulinemia, insulin resistance (IR), and an increased risk of cardiac diseases and endometrial cancer, are also present in PCOS-affected women in addition to irregular menstrual cycles, chronic anovulation, and hyperandrogenism. Metabolic syndrome (MetS) can be highlighted as a chronic danger if PCOS is not treated on a long-term basis. (Abbasi *et al.,* 2000)

Various strategies and characteristics of PCOS have been studied in research studies, however patient response to therapy varies greatly (Berek, 2012). Obesity worsens PCOS symptoms (Berrini *et al*., 2001) and 30 % to 75% of the PCOS-affected women are obese (Brooks *et al.,* 2004).Weight loss improves PCOS characteristics, and all PCOS-affected women should undertake lifestyle therapies such as diet and exercise, according to international evidence-based guidelines for PCOS testing and management. (De *et al.,* 2011). Since there is currently no cure for PCOS, care of overweight/obese women with PCOS focuses on weight loss through consistent exercise and diet to reduce the condition's clinical symptoms and the associated risk of T2DM and cardiovascular disease (CVD) (Giampaolino *et al.,* 2018).

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Diet and lifestyle choices seem to have an impact on PCOS, especially on how they affect body weight, insulin resistance, inflammation, oxidative stress, and, ultimately, androgen activity. Women with PCOS frequently have extra body fat, especially central adiposity, even when they are not obese. Between 30% and 75% of the PCOS patients are obese. (Hahn *et al.,* 2005). The targets of dietary objectives should be insulin resistance and excess weight. A low-fat, plant-based diet reduces insulin resistance, which affects 50–70% of women with PCOS (Holte, 1998 and Kataoka *et al.,* 2017). Low-fat, high-fibre diets efficiently treat dyslipidemia (elevated triglycerides, low HDL), elevated C-reactive protein and homocysteine, and circulating testosterone levels while increasing SHBG and decreasing and rogen levels (Lim *et al.,* 2013). Consuming a diet rich in fruits, vegetables, whole grains, and legumes also lowers inflammation and oxidative stress.

In case of PCOS-affected women who are overweight or obese, a range of balanced dietary regimens may be advised to decrease dietary energy intake and promote weight loss (De *et al.,* 2011). Micronutrients such as vitamins and minerals aid in improving ovulatory function and reducing inflammation.

Millets are superior to other cereals in terms of nutrients, health benefits, and phytochemical composition because they include higher levels of phenolic compounds, fibre, flavonoids, and phytosterols. These dietary elements boost the host's health due to their prebiotic properties, antioxidative actions, anti-inflammatory effects, and hypoglycemic profiles. These characteristics are enhancing PCOS when we analyze the role of millet in this disorder.The best millets for PCOS include ragi, jowar, bajra, and korra. These millets reduce cholesterol and blood sugar levels and are beneficial for PCOD. They naturally lack gluten, which is advantageous for PCOS. Millet is a rich source of iron, calcium, protein, and amino acids, all of which are necessary for PCOS.

In this study, the researcher attempted to formulate and evaluate a ragi-based nutrient supplement, rich in micronutrients and fibre by using underutilized, easily available and affordable ingredients for women with PCOS.

MATERIALS AND METHODS

The study was conducted during May, 2023 at Coimbatore. Standardization was carried out to find out if the supplement was palatable. Utilizing safe and standardized methods, the supplement powder was prepared. To determine the palatability, shelf life, and nutrient composition of the developed health mix, organoleptic evaluation, microbiological and nutrient analyses were performed.

Step 1: Procurement

Ingredients such as sesame (*Sesamu-m indicum),* jaggery *(Saccharum officinarum),* ragi *(Eleusine coracana),*whole oats *(Avena sativa),* flax seeds *(Linum usitatissiumum),* groundnut *(Arachis hypogaea),* sunflower seed *(Helianthus annus)* and pumpkin seed *(Curcubita maxima)* were procured from a nearby departmental store located in Coimbatore city.

Step 2: Formulation of Health mix

Using an electronic blender, all the ingredients were blended into a fine powder after being roasted at 120 °C for 10 to 15 minutes. Ragi was gradually increased from 30 g to 40 g, and whole oats were gradually decreased from 20 g to 10 g. The other ingredients remained constant. The health mix was prepared in three different proportions, namely Treatment I, Treatment II and Treatment III. The amount of ingredients used in each Treatment is listed in (Table 1).

Step 3: Organoleptic evaluation of Health mix

The most important factor in determining whether a food product is desirable in its quality. Organoleptic techniques can be used to assess food quality. When picking food, organoleptic quality—a concoction of various modalities of perception—comes into play. The acceptance of the food is influenced by its appearance, flavour, texture, and mouth feel (Moran *et al.,* 2013). A group of 30 semi-trained panellists evaluated the

Table 1. Amount of Ingredients

S.No.	Ingredients	Treatments (g)		
		I	II	III
1	Whole Ragi	30	40	35
2	Whole oats	20	10	15
3	Flax seed	10	10	10
4	Groundnut	10	10	10
5	Sunflower seed	8	8	8
6	Sesame	8	8	8
7	Jaggery	8	8	8
8	Pumpkin seed	6	6	6
	Total	**100**	**100**	**100**

sensory properties of the produced health mix using a 5-point hedonic scale (liked a lot, liked a little, neither liked nor disliked, disliked a little and disliked a lot) for several sensory aspects. Different supplement formulations were coded as I, II, and III to avoid making any presumptions. Sensory characteristics included appearance, aroma, taste, texture, and overall accessibility. The panelists had received some training and were all in good health. The panel members were given a score card to measure their preferences and likeliness, with scores ranging from 'extremely liked to extremely disliked' and instructions. The panellists were provided with fresh supplements in odourless containers and a glass of water to rinse their mouths between tests.

Step 4: Assessment of nutrient composition

A macronutrient and micronutrient analysis of the supplements was performed. Triplicate measurements of each nutrient were used for the analysis of nutrients. The Association of Official Analytical Collaboration's standard procedure (2018) was used to analyse these nutrients.

Step 5: Physico chemical andmicrobiological analysis of the selected health mix

In addition, the physicochemical and microbiological properties of the chosen health mix were examined. Total microbial counts (5 days) were determined using standard operating procedures (SOPs), and pH was determined using an electrometric method.

Statistical methods

One-way ANOVA was performed to examine the relationship between the various metrics utilized in the hedonic scale. SPSS (Statistical Package for the Social Sciences) Version 21.0 was used for the study.

RESULTS AND DISCUSSION

Organoleptic evaluation of the health mix

Consumer acceptance of food products was evaluated using the hedonic rating test. The mean scores of the several health mix compositions are depicted in Figure 1, and it can be seen that treatment III received the most significant marks for appearance, aroma, taste, texture, and overall acceptance. A total score of 681 out of 750 indicated that the product was favourably received. Organoleptic evaluation comments for samples indicated that Variation III was regarded as the best among the variants.

The created health mix's mean and standard deviation showed that the three variations' average overall acceptability was 2.63, 3.53, and 4.73 for variations I, II, and III, respectively (Table 2). The produced supplement was shown to be statistically significant ($P< 0.05$) when one-way ANOVA was

performed to examine the significance between the various metrics employed in the hedonic scale

Assessment of nutrient composition

For the nutritional analysis and total microbial count study, treatment III, which had the best overall score, was taken into account. Table 3 indicates the nutrients found in 100 g as well as the various techniques employed for nutritional analysis. The data clearly shows that formulated health mix was a rich source of fibre and micronutrients

Physico-chemical and microbiological analysis of selected health mix

In addition, the selected health mix's physicochemical and microbiological characteristics were investigated. SOPs were used to calculate the total microbial counts (5 days), and an electrometric approach was used to calculate pH. The results of the physicochemical and microbiological examination are shown in the Table 4. On the fifth day, the chosen health mix was plain and devoid of any bacterial or fungal counts. Fig. 2 and Fig. 3 depict microbiological analysis.

Recommended dietary allowances comparision

The nutrient profile of the supplement was compared to the Recommended Dietary Allowances (RDA) for adult women and was shown (Table 3). The supplement, shown in the table to be an energy-dense food, should be consumed to avoid a negative energy balance. It provides 451 kcal, which satisfies 27% of the daily energy needs of an adult woman. There are 14.8 g of fat and 16.5 g of protein in it. There was a sufficient amount of micronutrients in the developed health mix.

The micronutrients in the health mix have been shown to reduce blood sugar levels, boost insulin production, and control menstruation irregularities. The created health mix's enhanced magnesium and calcium content improves insulin sensitivity, boosts progesterone production in women, and reduces stress. The other minerals, such as zinc, selenium, and B vitamins, which are present in abundance in supplements, aid in weight reduction, boost immunity, regulate blood sugar levels, guard against free radical damage, and control other PCOS symptoms, such as inflammation and mood swings. According to De Groot *et al.* (2018), calcium and vitamin D directly

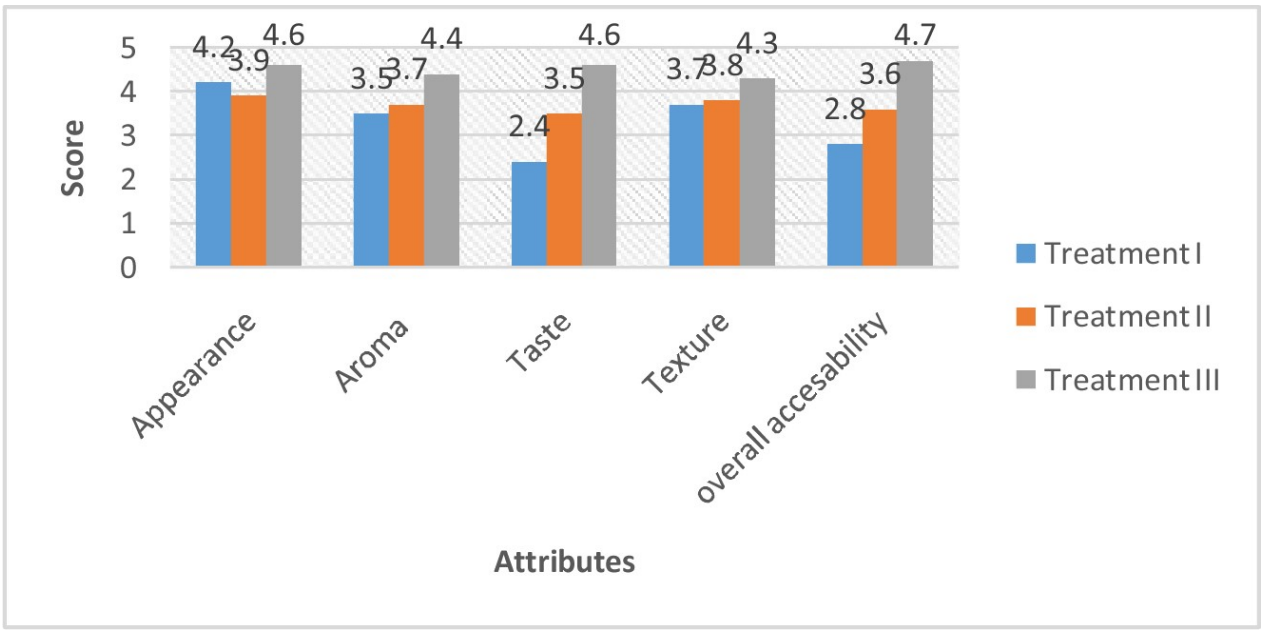

Figure 1. Mean scores of different variations

Table 2. Statistical analysis of standard and developed supplement

S. No.	Variation	Mean ± Standard Deviation	F Test	P Value
1	Treatment I	2.63 ± 0.890		
2	Treatment II	3.53 ± 0.819	7.210	0.001
3	Treatment III	4.73 ± 0.521		

Table 3. Nutrient composition of ragi based health mix and comparision with RDA

S. No.	Nutrient	Procedure	Result	RDA	RDA % for 100 g
1	Energy (Kcal)	Calculation Method	451	1660	27.2
2	Fat (g)	AOAC 18th Edition / FSSAI	14.8	20	74
3	Carbohydrate (g)	Calculation method	63	130	48.5
4	Protein (g)	FSSAI Manual of Methods	16.5	45.7	36
5	Fibre (g)	AOAC/BIS	8.2	33	25
6	Calcium (mg)	AOAC/BIS/FSSAI	230	1000	23
7	Magnesium (mg)	AOAC/BIS/FSSAI	74	325	23
8	Iron (mg)	AOAC/FSSAI	19.1	29	65
9	Zinc (mg)	AOAC	4.8	13.2	36
10	Selenium (mcg)	FSSAI	20	40	50
11	Vitamin A	Biochemical Methods/AOAC	35	840	4.1
12	Thiamine (Vit B1) (mg)	AOAC/FSSAI	1.2	1.4	85
13	Riboflavin (Vit B2) (mg)	AOAC/FSSAI	1.8	1.9	94
14	Niacin (Vit B3) (mg)	AOAC/FSSAI	2.7	11	24
15	Phosphorus (mg)	AOAC/BIS/FSSAI	210	1000	21
16	Potassium (mg)	AOAC 18thEdn/ FSSAI	628	3500	18

formulated health mix was a rich source of fibre and micronutrients

affect the ovarian tract, and the production of adrenal steroid hormones may be responsible for the observed drop in circulating testosterone levels.

The general acceptance of the ragi-based health mix (Treatment III) was rated on a 5-point hedonic scale and accepted as 'extremely liked'. Ingredients such as sesame, jaggery, ragi, whole oats, flax seeds, peanuts, sunflower seeds, and pumpkin seeds—all of which are rich in calcium, magnesium, zinc, selenium, B vitamins, and fibre—make up this health mix. The supplement is helpful for the treatment of PCOS due to its nutritious makeup.

Pasquali and Gambineri (2004) demonstrated that dietary fibre also regulates hormone metabolism by reducing insulin secretion by delaying the rate of glucose absorption after meals. Consumption of fibre shows a favorable connection with blood SHBG levels as well. Modern diets that are heavy in refined carbs and lacking in fiber cause insulin resistance and obesity (Reddy *et al.,* 2016).

Table 4. Physico-chemical and microbiological analysis of health mix

Physico-chemical analysis			
S.No.	**Parameter**	**Specification**	**Result**
1	Appearance	Good	Good
2	Colour	as it is	whitish brown
3	Odour	Agreeable	Agreeable
4	pH	6.5 - 8.0	6.8
Microbiological analysis			
S.No.	**Parameter**	**Specification**	**Result**
1	Total bacterial Count	Max 10x10³cfu/g	200x10¦"cfu/g
2	Total Fungal Count	<10cfu/g	<10cfu/g

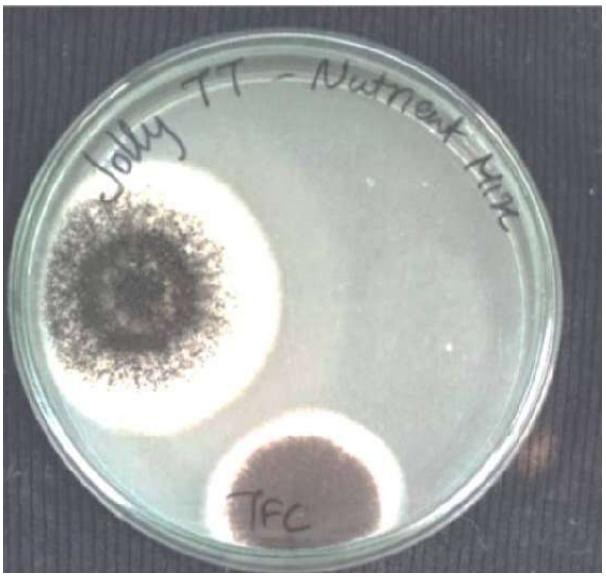

Figure 2. Total Fungal Count

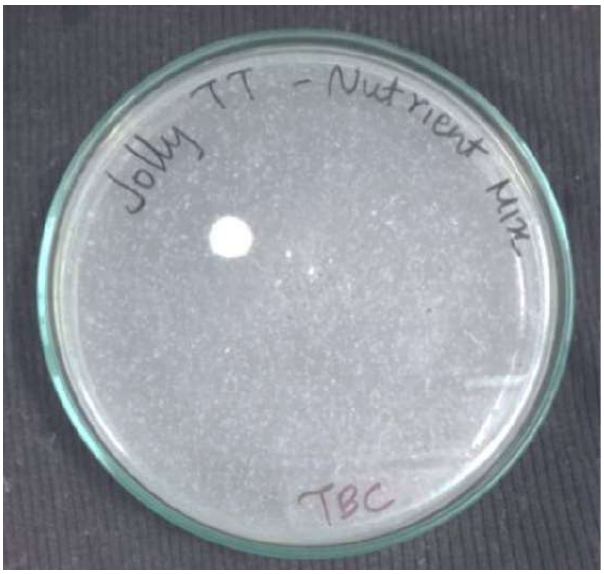

Figure 3. Total Bacterial Count

High concentrations of dietary lignin and lignin secoisolariciresinoldiglucoside (SDG) may be found in flaxseeds. By drastically lowering the ovarian volume and follicle count with a usual dose of 15 g of flax powder, menstruation frequency can be improved (Srilakshmi, 2015). Additionally, pumpkin seeds contain the advantageous omega-3 fatty acids that might aid in lowering the increased insulin and cholesterol levels linked to PCOS. They also include beta-sitosterol, which helps alleviate PCOS symptoms including hirsutism, acne, and weight gain by lowering too much androgen (Teede *et al.,* 2018).

CONCLUSIONS

Three different micronutrient-rich powder formulations have been developed as a result of this study. Treatment III was found to have superior qualities, including colour, texture, flavuor, and general acceptance. It contained sesame (8 g), jaggery (8 g), ragi (35 g), whole oats (15 g), flax seeds (10 g), peanuts (10 g), sunflower seeds (8 g) and pumpkin seeds (6 g). The nutrient analysis showed that formulated health mix is a rich source of fibre and micronutrients.This ragi-based supplement might be used to manage PCOS.

REFERENCES

Abbasi, F., McLaughlin, T., Lamendola, C., Kim, H, S., Tanaka, A and Wang, T. 2000. High carbohydrate diets, triglyceride-rich lipoproteins, and coronary heart disease risk. The American Journal of Cardiology. 85(1): 45-48.

Berek, J, S. 2012. Berek and Novak's Gynaecology. Berek, J, S. and Novak, E. (Editors), 15th Edition. Tehran: Golban Nashr Company: pp. 1384.

Berrino, F., Bellati, C and Secreto, G. 2001. Reducing bioavailable sex hormones through a comprehensive change in diet: the diet and androgens (DIANA) randomized trial. Cancer Epidemiology, Biomarkers and Prevention. 10 (1): 25-33.

Brooks, J, D., Ward, W, E., Lewis, J, E., Hilditch, J and Nickellm, 2004. L. Supplementation with flaxseed alters estrogen metabolism in postmenopausal women to greater extent than does supplementations with equal amount ofsoy. American Journal of Clinical Nutrition. 79: 318-325.

De, Groot, P, C., Dekkers, O,M., Romijn, J, A., Dieben, S, W and Helmerhorst, FM. 2011. PCOS, coronary heart disease, stroke and the influence of obesity: A systematic review and meta- analysis. Humun Reproduction. 17: 495-500.

Giampaolino, P., Della., Corte, L., De, Rosa, N., Mercorio, A., Bruzzese, D and Bifulco, G. 2018. Ovarian volume and PCOS: A controversial issue. Gynecological Endocrinology. 34(3): 229–232.

Hahn, S and Tan, S., Elsenbruch, S. 2005. Clinical and biochemical characterization of women with polycystic ovary syndrome in North Rhine- Westphalia. Hormone and Metabolic Research. 37(7): 438-44.

Holte, J. 1998. Polycystic ovary syndrome and insulin resistance:thrifty genes struggling with over-feeding and sedentary lifestyle. Journal of Endocrinological Investigation. 21(9): 589-601.

Kataoka, J., Tassone, E, C., Misso, M., Joham, A., Stener, Victorin, E., Teede, H and Moran, L. 2017. Weight management interventions in women with and without PCOS: A systematic review. Nutrients. 9(9):996.

Lim, S, S., Norman, R, J., Davies, M, J and Moran, L, J. 2013. The effect of obesity on polycystic ovary syndrome: A systematic review and meta-analysis. Obesity Reviews. 14 (2): 95–109.

Moran, L, J., Ko, H and Misso, M. 2013. Dietary composition in the treatment of polycystic ovary syndrome: A systematic review to inform evidence-based guidelines. Journal of the Academy of Nutrition and Dietetics. 113(4): 520-45.

Pasquali, R and Gambineri, A. 2004. Role of changes in dietary habits in polycystic ovary syndrome. Reproductive Biomedicine Online. 8(4):431-439.

Reddy, P. S., Begum, N., Mutha, S and Bakshi, V. 2016. Beneficial effect of curcumin in Letrozole induced polycystic ovary syndrome. Asian Pacific Journal of Reproduction. 5(2): 116–122.

Srilakshmi, B. 2015. Food Science. New Delhi: New Age International Private Limited. pp. 308.

Teede, H, J., Misso, M, L., Costello, M, F., Dokras, A., Laven, J., Moran, L., Piltonen, T., Norman, R, J., Andersen, M and Azziz, R. 2018. Recommendations from the international evidence-based guideline for the assessment and management of polycystic ovary syndrome. Human Reproduction. 33(9):1602–1618.

Jolly, T.T and Thirumani, Devi, A. 2023. Ragi health mix for managing polycystic ovarian syndrome: Formulation and nutrient analysis. The Journal of Research ANGRAU. 51(2):75-81.
DoI: https://doi.org/10.58537/jorangrau.2023.51.3.09

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DIETARY HABITS AND NUTRITIONAL RISK IN COLLEGE GIRLS: A STUDY IN THRISSUR, KERALA

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HSAI life membership Number: [1] HSAI-2024-KL-1758-LF , [2] 93/T-6/LF

ABSTRACT

Young adult women's health is a multidimensional and dynamic component that includes physical, mental, and social well-being. Lifestyle choices, access to healthcare, social level, and cultural influences all have an impact on their overall health. Assessing young adult women's health demands a comprehensive approach that takes into account the interconnectivity of physical, mental, and social aspects. Promoting a complete awareness of their health requirements helps to establish tailored treatments and healthcare policies that benefit their well-being. This study investigates the food habits, lifestyle patterns, and nutritional risk factors of college girls in Thrissur, Kerala. A detailed investigation was carried out to determine the influence of lifestyle choices on nutritional well-being. The findings include a wide spectrum of dietary choices and lifestyle patterns, with a special emphasis on identifying possible risk factors for nutritional disorders. This study's findings help us better understand the particular issues that this group faces, opening the path for successful solutions to improve their overall nutritional health and well-being.

Keywords: College students, Dietary habits, Lifestyle pattern, Nutritional problems, Physical Activity, Exercise

INTRODUCTION

The shift from youth to adulthood is a crucial time for the establishment of behavioural habits that influence the risk of chronic diseases and long-term health (Meg et al, 2012). Young adulthood is distinct from adolescence and elder adulthood. When given new roles and urged to emulate adult behavior, young women go through a transitional period. Their nutrition greatly affects young women's health. Limiting high-calorie foods and encouraging girls and young women to exercise can balance the energy equation. They form a lifelong healthy eating habit early on. College students, considered young adult women, can make bad eating choices that harm their health (S. Abraham et al., 2018). Most undergraduates eat in university dining halls with few healthy options1 (S. Abraham et al., 2018). Long-term cohort research shows that most US college freshman consume more added sugar, processed carbohydrates, salt, and saturated fat than advised (George Mason University, 2022).According to the results of another research, only one in five pupils exhibit "favourable eating behaviours," which include eating a lot of fruit and vegetables, eating little fast food, and snacking moderately (1). Additionally, researchers have discovered that students are more prone to acquire weight (1) compared to others their age who do not attend university.

College students' lifestyles vary greatly, according to studies in the International Journal of Indian Psychology, college students are trend-seeking, academically oriented, career-focused, socially focused, health-conscious, and family-focused (Int. jr of Ind. Psychology, 2015). Another study in the same population discovered a small but significant relationship between physical activity and college students' overall quality of life, as well as a link between physical activity and the quality of life domains of physical health, social relationships, mental health, environment, and vitality[(2)].

Exercise is essential for a healthy lifestyle, even for college students. Research suggests that exercise may improve undergraduate students' mental health [(2)]. Recreational physical exercise on campus increased grades by 0.14 standard deviations, according to the Centre for Education Policy Analysis (Fricke H, 2017). Another study found a weak but positive correlation between physical activity and college students' quality of life in the environment, vitality, mental health, social relationships, and physical health domains (Fricke H, 2017).

Poor eating habits and limited food selections put college students at risk for nutritional difficulties [(3)]. "Food insecurity," or the inability to get enough food, especially healthful meals, affects many college students [(4)]. Racial and ethnic minorities miss more meals or go hungry, however the amount varies by institution and student group [(4)]. College students often lack zinc, calcium, and vitamin B12 [(3)]. Insufficient exercise and poor diets are connected to obesity and osteoporosis (Majem L et al, 2006).

The current study set out to examine college students' lifestyles in Kerala's Thrissur area. Specifically, lifestyle patterns, eating habits, and nutritional issues risks were taken into account.

OBJECTIVES

1. Evaluate college girls' eating habits, including meal frequency, food types, and unhealthy practices like skipping meals and fast food consumption.
2. Determine potential nutritional risk factors, focusing on obesity, underweight, anemia, and nutrient deficiencies.
3. Investigate how lifestyle factors, including physical activity and sleep patterns, impact nutritional health.
4. Analyze how age, religion, and family characteristics influence dietary habits and nutritional status.

HYPOTHESES

1. College girls with poor dietary habits, such as frequent fast food consumption and meal skipping, are more likely to have nutritional deficiencies compared to those with balanced diets.
2. Higher physical activity levels among college girls correlate with a lower risk of obesity and nutritional disorders.
3. Age, family type, and socio-economic status significantly influence the dietary choices and nutritional status of college girls.

METHODS AND MATERIALS

Study Design

A cross-sectional study was carried out to better understand the dietary habits, lifestyle patterns, and likelihood of nutritional problems among college-going students in Thrissur, Kerala, ages 18 to 21. The research was conducted from June to August of 2023.

Study Population

The research population includes students from Little Flower College Guruvayur, St. Joseph College Irinjalakkuda, Carmel College Mala, Vimala College Thrissur, and St. Mary's College Thrissur. Young adult women between 18 and 21 who were enrolled in the colleges and gave a written consent were eligible to participate. Exclusion criteria included students with other health issues, expecting and nursing mothers, and those who rejected consent.

Sample Size Calculation

It was decided to use the Daniel Formula [Z^2P (1-P)/d2] to calculate the sample size (1250) (Daniel, 1978). The Prevalence rate (P) is 16% and the margin of error (d) is 0.02 when the Z score is assumed to be 95%.

Sampling Technique

Purposive sampling was utilized in the study to choose the colleges, and random sampling was employed to choose individuals from the chosen institutions.

Data Collection Method

The current study collected data by systematic questionnaire. Self-administered questionnaires collected sociodemographic, lifestyle, dietary, and nutritional data. Each questionnaire recipient had a unique number. The questionnaire collected these data:

The study analyzed socio-demographic characteristics, lifestyle patterns, and anthropometric measurements of selected students. It assessed nutritional risk using six risk indicators for five nutritional issues: anemia, obesity, underweight, osteoporosis, and prediabetes. Data was collected on dietary patterns, daily meals, skipping meals, eating outside habits, taste preferences, food allergies, and fat-dense food consumption. The questionnaire was pretested by distributing it to 10% of the study subjects (125) from five colleges in the Thrissur district. The Human Ethical Committee of Vimala College (Autonomous) Thrissur provided ethical clearance (VC/REC/23- 24-1) for this study, and respondents gave informed consent.

RESULTS AND DISCUSSION

A self-administered questionnaire was used to analyse the food patterns and nutritional condition of college students in the Thrissur area. The study involved 1,250 female students. Information on socio-demographic traits, lifestyle patterns, eating habits, and nutritional concerns was collected.

Table 1 Socio Demographic characteristics of respondents

Variables	Frequency (n=1250)	Percent
Age group		
18	400	32
19	570	45.6
20	211	16.9
21	69	5.5
Religion		
Hindu	745	59.6
Muslim	235	18.8
Christian	270	21.6
Type of Family		
Nuclear	1095	87.6
Joint	155	12.4
Family size		
1-4	743	59.4
5-8	484	38.7
>8	23	1.8

Only 69 (5.5%) responders were between 21 and 19, with 570 (45.6%) falling between those ages. Hindus dominated with 745 (59.6%), Christians with 270 (21.6%), and Muslims with 235 (18.8%). 87.6% (1095) were nuclear families, while 155 (12.4%) were joint families. According to respondents' family size evaluation, 743 (59.4%) were from 1 to 4 families, 484 (38.7%) from 5 to 8, and 23 (1.8%) from more than 8 families.

A multi-disciplinary expert group organized by the National Sleep Foundation suggested 7-9 hours of sleep each day for young adults (18-21 years) (Hirshkowitz M et al,2015). In this present study, 804 (64.2%) subjects were getting 6 to 8 hours of sleep and only seven (0.6%) of them were getting less than 4 hours of sleep. Shorter sleep duration, or poor sleep, has been linked to obesity during the past decade. This connection is greater among children and young adults than among older persons (Nielsen, 2011).

Table 2 Lifestyle of respondents

Variable	Frequency (n=1250)	Percent
Sleep duration		
<4 hrs.	7	0.6
4-6 hrs.	334	26.7
6-8 hrs.	804	64.2
>8 hrs.	105	8.5
Do you exercise regularly?		
Yes	289	23.2
No	961	76.8
Time of exercise		
Morning	186	64.4
Evening	103	35.6

People aged 18 to 64 should engage in moderate to vigorous physical activity (MVPA) at least 5 days a week, preferably for 60 minutes for health advantages, according to the CDC[(5)]. The WHO (2013) recommends reducing insufficient physical activity by 10% by 2025. Only 23.2% (289) people took regular exercise, and 200 (69.2%) exercised 30 minutes daily. 41 (14.2%) had more than an hour of exercise daily. Most (88, 30.6%) chose brisk walking as their daily workout, while 12.8% (37) chose yoga. Morning exercise was done by 186 (64.4%) respondents and evening exercise by 103 (35.6%).

Figure 1 Type of Exercise (n=289)

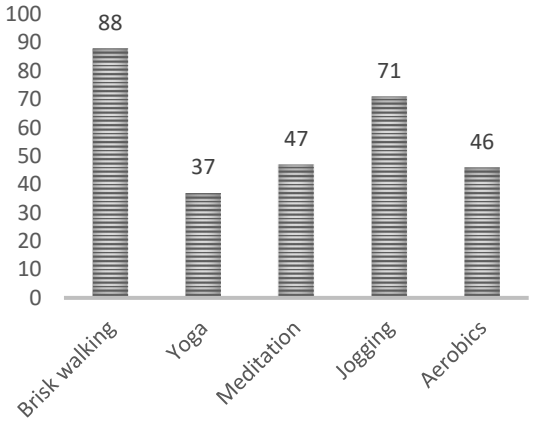
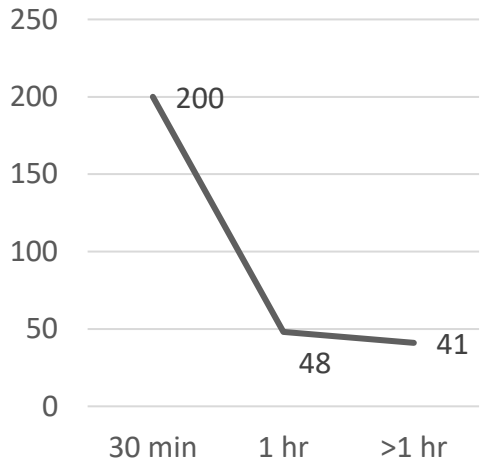


Figure 2 Time spent daily on Exercise (n=289)



Dietary practice affects several aspects of diet variation and adolescent nutrition. Young people are more likely to miss meals, eat fast food and dine out, consume too much sugar, and eat less fruit and vegetables than other age groups (Zhou et al., 2015). Most responders (1095, 87.6%) were non-vegetarian. Six hundred and ten (48.8%) respondents ate three main meals and one snack per day, while 61 (4.9%) ate more. 52% (651) skipped meals. Most respondents (1095, 87.6%) were non-vegetarian. Six hundred and ten respondents (48.8%) ate three main meals and one snack daily, whereas 61 (4.9%) ate more. 52% (651) occasionally skipped meals.

Figure 3 Causes for skipping meal

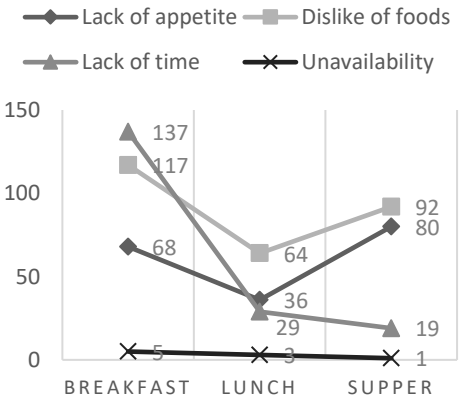


Table 3 Dietary pattern of respondents

Variable	Frequency (n=1250)	Percent
Dietary pattern		
Vegetarian	95	7.6
Non- Vegetarian	1095	87.6
Ovo- vegetarian	37	2.9
Lacto-Vegetarian	23	1.8
Meals per Day		
2 full meals only	352	28.2
3 full meals only	227	18.2
3 meals & 1 snack	610	48.8
More than 3 meals	61	4.88
Habit of Skipping meals		

Yes	651	52
No	599	48
Habit of eating outside		
Yes	968	77
No	282	23
Food Allergy		
Yes	162	13
No	1088	87

Half of the respondents (327, 50.2%) among them skipped the breakfast, mainly because of the lack of time (137, 42%). Food dislike was the main reason for skipping lunch (64%) and dinner (48%). The food was scarce, thus some individual skipped breakfast (1.6%), lunch (2.2%), and dinner (0.5%). Lack of Appetite (Breakfast 20.8%, Lunch 27.8%, and Supper 41.7%) was another reason for skipping meals. The majority of respondents (968) ate outside food. Among them, 53.8% eat outside food monthly. About 2.5% of participants ate outside food daily. In order of preference, 48% favored spicy dishes, followed by Sweet (31%), Fried (8%), Cold (5%), Hot (4%), and Salty (4%). Early study on taste preferences, food intake, and obesity found that high flavor intensity increases food palatability, leading to overconsumption and obesity (Nasser J, 2001).

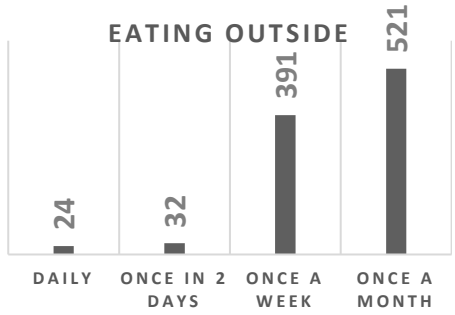


Figure 4 Eating from the outside

NHANES says "young people (20-29 years old) spend more than 40% of their daily energy away from home; hence, restaurant meals and beverages may have a major effect on overall nutritional quality" [6]. Research on young adult diets shows that fast-food outlets are visited two to three times a week (Niemeir, 2006). Table 4 illustrates respondents' fat-dense meal consumption. 18.9% of respondents eat fried snacks every day and 58.3% weekly. Data showed 13.4% of individuals never drank fizzy drinks.

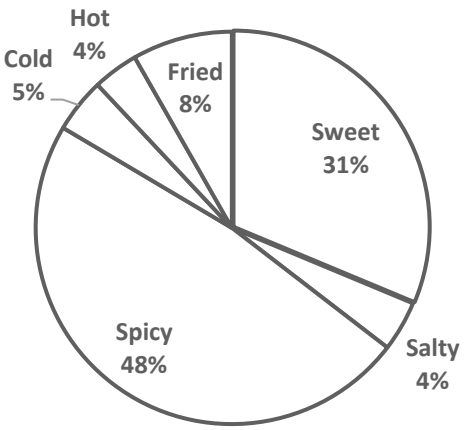


Figure 5 Taste preference of the respondents

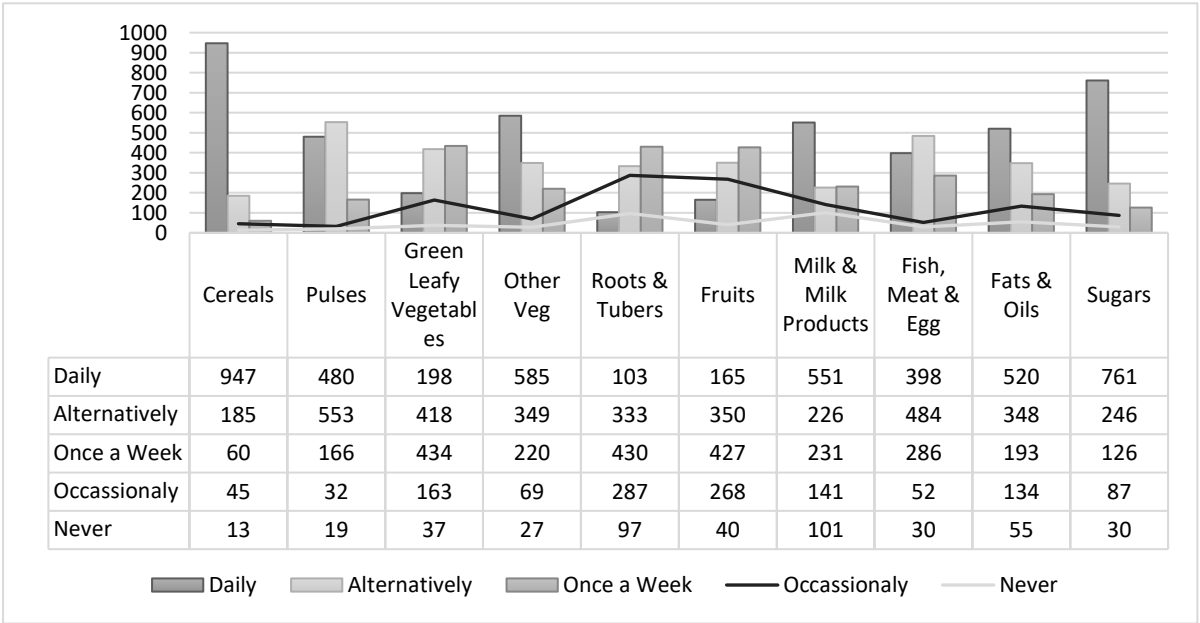
Healthy diet benefits general health and prevents cardiovascular disease, diabetes, high blood pressure, stroke, cancer, dental caries, and asthma. Children and teens' physical and cognitive development depends on healthy diet. Fig. 6 shows food frequency table analysis. Over 75% (947) of respondents eat cereals every day, while 44.2% (553) eat pulses occasionally. 23% (287) occasionally ate roots and tubers. Milk and milk products are never consumed by 101 participants (8%).

Table 4 Consumption of fat dense foods

Food Items	Daily	Percent	Weekly	Percent	Monthly	Percent	Yearly	Percent	Never	Percent
Fried snacks	237	**18.96**	729	**58.32**	229	**18.32**	17	**1.36**	38	**3.04**
Non Veg snacks	76	**6.08**	660	**52.8**	403	**32.24**	38	**3.04**	73	**5.84**
Carbonated drinks	26	**2.08**	262	**20.92**	630	**50.4**	164	**13.12**	168	**13.44**
Sweet items	262	**20.96**	652	**52.16**	266	**21.28**	41	**3.28**	29	**2.32**
Bakery Items	**301**	24.08	**624**	49.92	**264**	21.12	**33**	2.64	**28**	**2.24**

Participants received a checklist with six physical indications of anemia, obesity, underweight, osteoporosis, and prediabetes. The findings showed that 74 respondents had more than three obesity symptoms, 47 had anemia symptoms, and 44 had prediabetes symptoms. 25 respondents had three or more underweight symptoms, whereas 17 had three or more osteoporosis symptoms. Nutrition is one of the most effective and adaptive environmental variables for reducing illness across a lifetime. A healthy diet and metabolism offer the substrates the body requires for its daily functions. In a balanced diet, macronutrients provide energy, whereas micronutrients are needed for practically all metabolic and developmental processes. Poor nutrition increases the risk of diabetes, heart disease, and cancer (Kiani et al., 2022).

Figure 6 Food Frequency table Analysis



	Cereals	Pulses	Green Leafy Vegetables	Other Veg	Roots & Tubers	Fruits	Milk & Milk Products	Fish, Meat & Egg	Fats & Oils	Sugars
Daily	947	480	198	585	103	165	551	398	520	761
Alternatively	185	553	418	349	333	350	226	484	348	246
Once a Week	60	166	434	220	430	427	231	286	193	126
Occassionaly	45	32	163	69	287	268	141	52	134	87
Never	13	19	37	27	97	40	101	30	55	30

Figure 7 Risk of Nutritional Problems

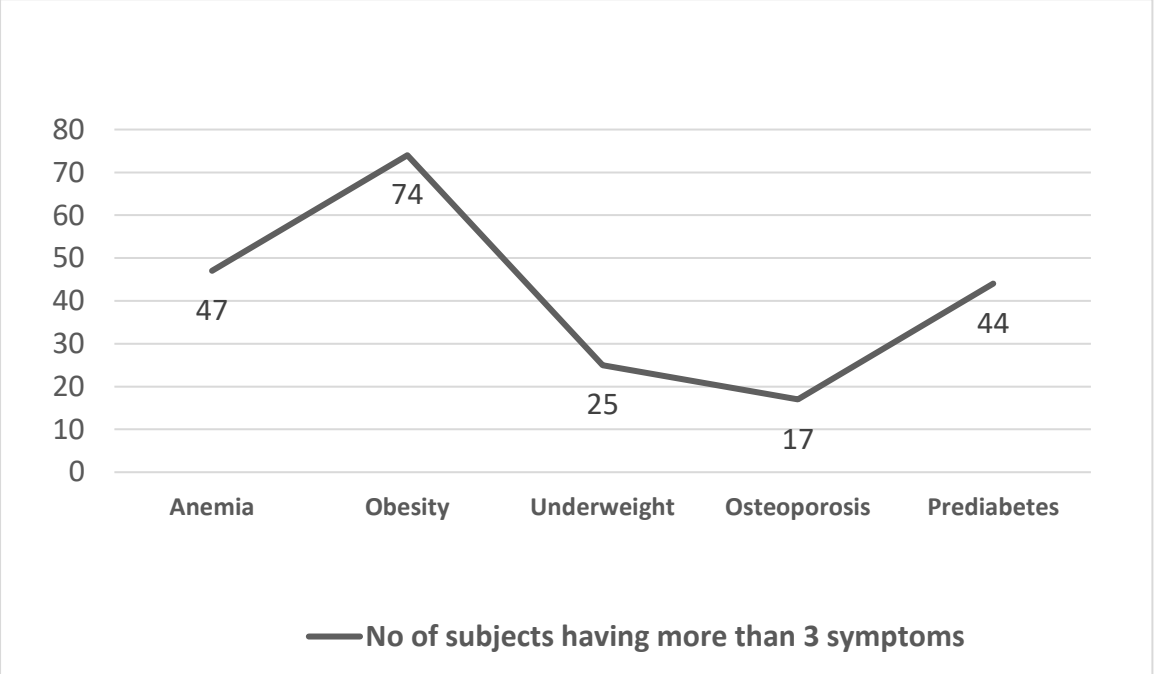


Table 5 Assessment of nutritional problems

PHYSICAL SIGNS	YES	Percent	NO	Percent
ANAEMIA				
Dizziness and fatigue after physical activity	299	23.92	951	76.08
Pale nails	83	6.64	1167	93.36
Frequent minor infections	109	8.72	1141	91.28
Shortness of breath	194	15.52	1056	84.48
Headache	590	47.2	660	52.8
Angular stomatitis	64	5.12	1186	94.88
OBESITY				
Breathlessness	130	10.4	1120	89.6
Increased sweating	268	21.44	982	78.56
Snoring	34	2.72	1216	97.28
Difficulty doing physical activity	162	12.96	1088	87.04
Often feeling tired	372	29.76	878	70.24
Joint and back pain	379	30.32	871	69.68
UNDERWEIGHT				
Fatigue and lethargy	141	11.28	1109	88.72
Low heart rate	34	2.72	1216	97.28
Night sweats	86	6.88	1164	93.12
Having cold fingers and toes	186	14.88	1064	85.12
Muscle problems	206	16.48	1044	83.52
Nausea	88	7.04	1162	92.96
OSTEOPOROSIS				
Change in posture	81	6.48	1169	93.52
Shortness of Breath	104	8.32	1146	91.68
Frequent Bone fracture	31	2.48	1219	97.52
Pain in the lower back	229	18.32	1021	81.68
Receding gums	79	6.32	1171	93.68
Weaker grip strength	53	4.24	1197	95.76
PREDIABETES				
Increased Thirst	177	14.16	1073	85.84
Frequent Urination	157	12.56	1093	87.44
Increased hunger	234	18.72	1016	81.28
Fatigue	133	10.64	1117	89.36
Unintended weight loss	81	6.48	1169	93.52
Blurry vision	104	8.32	1146	91.68

This table (Table 6) shows substantial associations between health factors and health outcomes. Anaemia and obesity are most correlated (r=0.519), suggesting a relationship. Anaemia often coexists with underweight, osteoporosis, and pre-diabetes, as shown by moderate positive

relationships. Obesity has moderate connections with osteoporosis and pre-diabetes, supporting research on the complicated relationship between body composition and metabolic health. Underweight condition is linked to osteoporosis and pre-diabetes, highlighting its health hazards.

Table 6 Significant Correlations among Health variables

Variable Pair	Pearson Correlation (r)	Significance (2-tailed)
Anaemia - Obesity	0.519	0.000
Anaemia – Under Weight	0.452	0.000
Anaemia – Osteoporosis	o.464	0.000
Anaemia – Pre diabetes	0.434	0.000
Obesity – Osteoporosis	0.499	0.000
Obesity – Pre diabetes	0.488	0.000
Underweight – Osteoporosis	0.466	0.000
Under weight – Pre diabetes	0.437	0.000
Osteoporosis – Pre diabetes	0.454	0.000

These findings support literature linking dietary status, bone health, and metabolic diseases. Anaemia and obesity owing to chronic inflammation are linked, as is low body weight and osteoporosis. The obesity-pre-diabetes link matches metabolic syndrome research. These results emphasize the need for comprehensive health assessments and interventions that target various, linked health issues.

One of the biggest nutritional and health issues affecting young adults in both industrialized and developing nations is obesity, a multifactorial metabolic syndrome linked to excess adipose tissue. Obesity and overweight are becoming increasingly common as a result of urbanization, lifestyle changes, and decreasing physical activity (Jebeile, 2022). In addition to the detrimental psychological implications of obesity, study data indicate that around 70-80% of obese teenagers develop into obese adults. Obesity and overweight throughout early adulthood might raise the chance of acquiring chronic illnesses (Anderson et al, 2014).

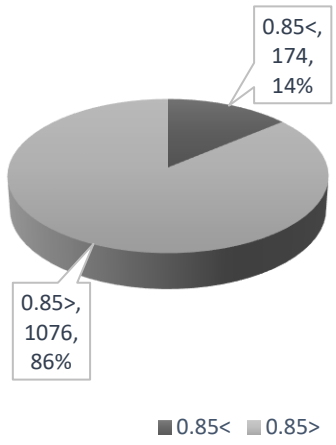


Figure 8 Waist Hip ratio

Table 7 Categorisation of Subject on the basis of Body Mass Index

Body Mass Index	Percent of subjects
Below 18.5 (Under-weight)	30.32
18.5 – 24.9 (Normal)	59.44
25.0 – 29.9 (Overweight)	8.8
30.0 – 34.9 (Obese II)	1.3
35.0 – 39.9 (Obese II)	0.08
Above 40 (Obesity III)	0.08

The respondents were assessed for Body Mass Index and waist-hip ratio. 30.32% of the subjects were categorised as under-weight, 59.44% as Normal, 8.8% as Overweight and 1.44% in the obese category (1.3% Class I, 0.08% Class II and Class III). According to WHO classification Waist hip

ratio less than 0.85 is less risk for metabolic diseases and greater than 0.85 is substantially increased risk for metabolic diseases. 86% of the subjects who attended the present study had less risk for metabolic diseases and 14% of the respondents had increased risk for developing metabolic diseases.

The analysis of dietary habits and BMI in our study holds particular relevance for young adult women, a demographic often concerned with weight management and body image. Our findings suggest that this group may benefit significantly from adopting healthier eating patterns. For young women, the correlation between diets high in fruits, vegetables, and low-fat foods and lower BMIs offers a promising path for weight management without resorting to extreme dieting. The observed link between irregular eating habits, such as meal skipping, and higher BMIs is especially pertinent, as busy lifestyles common among young adult women can lead to erratic eating schedules. Additionally, the association between frequent consumption of meals prepared outside the home and increased BMI is crucial, given the social nature of dining out in this age group. These insights can inform targeted interventions for young adult women, emphasizing balanced, regular meals and mindful choices when eating out, potentially leading to improved body composition and overall health outcomes in this population.

Table 8 Correlation Coefficients and significance Levels for BMI, Lifestyle Factors, and Dietary Habits

Factors	Correlation coefficient	P value
Correlation of BMI with WHR, Sleep duration and Habit of doing exercise		
WHR	0.191	0.000
Sleep duration	-0.131	0.000
The habit of doing exercise	0.109	0.000
Correlation of Habit of Skipping meals with Meals per day, Eating from the outside and Taste preference		
Meals per day	0.142	0.000
Habit of eating from the outside	0.068	0.016
Taste preference	-0.027	0.332

CONCLUSION

In conclusion, this study throws light on the importance of lifestyle, eating habits, and nutritional patterns among college students. The findings highlight the importance of specific interventions and educational initiatives to encourage healthy behaviours and nutritional choices among this population. According to the study, many students struggle to maintain a balanced diet, which can lead to nutritional deficits and long-term health consequences.

- The hypothesis stated that college girls with poor dietary habits would have a higher likelihood of nutritional deficiencies. The study confirmed this, showing that a significant portion of participants engaged in unhealthy eating practices, such as frequent fast food

consumption and meal skipping, which correlated with signs of nutritional deficiencies and health issues.

- The hypothesis suggested that higher physical activity levels would be associated with a lower risk of obesity and nutritional disorders. The findings supported this, indicating that only a small percentage of participants engaged in regular exercise, and those who did reported better overall nutritional health compared to their less active peers.
- The hypothesis proposed that socio-demographic factors would significantly influence dietary choices and nutritional status. The study validated this hypothesis by revealing variations in dietary habits and nutritional risks based on age, family type, and socio-economic status, indicating that these factors play a crucial role in the health outcomes of college girls.

Overall, the study's findings align well with the proposed hypotheses, highlighting the interconnectedness of dietary habits, physical activity, and socio-demographic influences on the nutritional health of college girls. Comprehensive wellness activities, both within educational institutions and via community outreach, are critical for instilling a culture of health and well-being among college students. By proactively treating these concerns, we can improve this population's overall physical and mental well-being, laying the groundwork for long-term health and success. More research and collaboration among educators, health experts, and policymakers are required to create successful techniques that enable college students to make educated decisions and prioritize their health in the face of academic and social pressures.

REFERENCES

- Abraham, S., Noriega, B. R., & Shin, J. Y. (2018). College students eating habits and knowledge of nutritional requirements. *J Nutr Hum Health*, *02*(01). https://doi.org/10.35841/nutrition-human-health.2.1.13-17
- Anderson, A. D., Solorzano, C. M., & McCartney, C. R. (2014). Childhood obesity and its impact on the development of adolescent PCOS. *Seminars in reproductive medicine*, *32*(3), 202–213. https://doi.org/10.1055/s-0034-1371092
- Daniel,W.W., & Cross, C. L. (2013). Biostatistics: a foundation for analysis in the health sciences. Tenth edition. Hoboken.NJ, Wiley
- Fricke, H., Lechner, M., & Steinmayr, A. (2017). The Effect of Physical Activity on Student Performance in College: An Experimental Evaluation.
- George Mason University. (2022). New Study Finds that College Freshmen Exceed Many U.S. Dietary Guidelines, Increasing Risk.
- Hirshkowitz, M., Whiton, K., Albert, S. M., Alessi, C., Bruni, O., DonCarlos, L., Hazen, N., Herman, J., Katz, E. S., Kheirandish-Gozal, L., Neubauer, D. N., O'Donnell, A. E., Ohayon, M., Peever, J., Rawding, R., Sachdeva, R. C., Setters, B., Vitiello, M. V., Ware, J. C., & Adams Hillard, P. J. (2015). National Sleep Foundation's sleep time duration recommendations: methodology and results summary. *Sleep health*, *1*(1), 40–43. https://doi.org/10.1016/j.sleh.2014.12.010
- V Rohit, S Makwana. (2015). Lifestyle: A Comparative Study of the Arts and Science college students. *International Journal of Indian Psychology*, *2* (2), DOI: 10.25215/0202.065, DIP: 18.01.065/20140202

- Jebeile, H., Kelly, A. S., O'Malley, G., & Baur, L. A. (2022). Obesity in children and adolescents: epidemiology, causes, assessment, and management. *The lancet. Diabetes & endocrinology*, *10*(5), 351–365. https://doi.org/10.1016/S2213-8587(22)00047-X
- Kiani, A. K., Dhuli, K., Donato, K., Aquilanti, B., Velluti, V., Matera, G., Iaconelli, A., Connelly, S. T., Bellinato, F., Gisondi, P., & Bertelli, M. (2022). Main nutritional deficiencies. *Journal of preventive medicine and hygiene*, *63*(2 Suppl 3), E93–E101. https://doi.org/10.15167/2421-4248/jpmh2022.63.2S3.2752
- Small, M. L., Morgan, N., Bailey-Davis, L., & Maggs, J. L. (2013). The protective effects of parent-college student communication on dietary and physical activity behaviors. *The Journal of adolescent health : official publication of the Society for Adolescent Medicine*, *53*(2), 300–302. https://doi.org/10.1016/j.jadohealth.2013.03.010
- Nasser J. (2001). Taste, food intake and obesity. *Obesity reviews: an official journal of the International Association for the Study of Obesity*, *2*(4), 213–218. https://doi.org/10.1046/j.1467-789x.2001.00039.x
- Nielsen, L. S., Danielsen, K. V., & Sørensen, T. I. (2011). Short sleep duration as a possible cause of obesity: critical analysis of the epidemiological evidence. *Obesity reviews : an official journal of the International Association for the Study of Obesity*, *12*(2), 78–92. https://doi.org/10.1111/j.1467-789X.2010.00724.x
- Niemeier, H. M., Raynor, H. A., Lloyd-Richardson, E. E., Rogers, M. L., & Wing, R. R. (2006). Fast food consumption and breakfast skipping: predictors of weight gain from adolescence to adulthood in a nationally representative sample. *The Journal of adolescent health : official publication of the Society for Adolescent Medicine*, *39*(6), 842–849. https://doi.org/10.1016/j.jadohealth.2006.07.001
- Serra-Majem, L., Aranceta Bartrina, J., Pérez-Rodrigo, C., Ribas-Barba, L., & Delgado-Rubio, A. (2006). Prevalence and deteminants of obesity in Spanish children and young people. *The British journal of nutrition*, *96 Suppl 1*, S67–S72. https://doi.org/10.1079/bjn20061703.
- World Health Organiztion (WHO). (2013) Global action plan for the prevention and control of noncommunicable diseases 2013–2020. Geneva: World Health Organization
- Zhou, Y., Wang, J., Duan, Y., Luo, X., Wan, Z., Luo, Y., Li, Y., Wang, Y., & Xie, J. (2022). Dietary diversity and determinants of young adults in central China: A cross-sectional study from 2015 to 2020. *Frontiers in nutrition*, *9*, 931107. https://doi.org/10.3389/fnut.2022.931107
- BBC Future. Do students really eat that badly? https://www.bbc.com/future/article/20221128-do-students-really-eat-that-badly
- Physical Activity and Mental Health in Undergraduate Students - MDPI. (2022). https://www.mdpi.com/1660-4601/20/1/195.
- The College Puzzle. (2017). Nutrient Deficiencies Common Among College Students. https://collegepuzzle.stanford.edu/nutrient-deficiencies-common-among-college-students/
- Journalist's Resource. (n.d.). College student hunger: How access to food can impact grades, health. https://journalistsresource.org/economics/college-student-hunger-food-pantry/
- U.S. Centers for Disease Control and Prevention. Are there special recommendations for young people? 2007. Available at: http://www.cdc.gov/nccdphp/dnpa/physical/recommendations/young.htm. 22 May 2007
- *WWEIA Data tables : USDA ARS*. (n.d.). https://www.ars.usda.gov/northeast-area/beltsville-md-bhnrc/beltsville-human-nutrition-research-center/food-surveys-research-group/docs/wweia-data-tables/