ASSOCIATION OF CIRCADIAN RHYTHM AND HEDONIC HUNGER IN 25 - 45 YEAR OLD PATIENTS DIAGNOSED WITH HYPOTHYROIDISM

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ABSTRACT

Endocrine disorders are considered to be common within the Indian population and thyroid disorders constitute the majority of the concerns. Hypothyroidism is a medical condition wherein the thyroid gland is unable to produce enough thyroid hormones to meet the demands of the peripheral tissues. Reduced thyroid hormone production could have an impact on how well people sleep in general. The circadian rhythm is a biological clock that is created in our brains to work during everybody's day and night processes inside a 24-hour clock frame. Although this alignment is frequently upset by modern changes to our living conditions, work or social schedules, patterns of light exposure, and biological factors, these disruptions have an impact on our physical and mental health in addition to sleep timing. Hedonic hunger (HH) is the term used to describe an imbalance of hormones that control appetite that causes people to crave highly appealing foods (i.e., foods heavy in sugar, salt, and fat) even when they are not physiologically hungry. Individuals' levels of hedonic hunger differ, and those who score the highest on the hedonic hunger scale might have troublesome behavioral and physiological traits. Circadian rhythm disruption can cause a shift towards faulty eating habits and heightened eating for pleasure in females. Educating people about the awareness of the association between circadian rhythm patterns and hedonic hunger will help to create changes in their lifestyle and improve their well-being of the person. This association will help medical professionals to better help patients and women control their disturbed sleeping patterns and faulty eating habits.

Keyword :- *Circadian Rhythm, Hedonic Hunger, Morningness Eveningness Questionnaire, Power of Food Scale, Hypothyroidism.*

1. CIRCADIAN RHYTHM AND HEDONIC HUNGER

The 24-hour period that makes up a day is when the human body first gets active after arising in the course of this time, our body goes through a variety of biochemical, emotional, and behavioral changes (rest, sleep, hunger, thirst, urination, etc). The human body becomes synchronized to the events when it has a sequence of them over a long length of time, and this synchronization may eventually lead to our twenty-four-hour habit. [1]

Hedonic hunger is the term used to describe a sort of hunger that does not result from a lengthy food shortage but rather from a desire or urge to eat for enjoyment. In contrast to actual food consumption, hedonic hunger refers to the internal state. The hedonic response to pleasure known as "liking" and the incentive-motivated state known as "wanting" are two psychological factors of food incentive. The "liking" and "wanting" aspects of rewards are connected to several neuroanatomical and neurochemical reward systems in the brain. The motivations for hedonic eating could be "liking," "wanting," or both. [2] This association is important to draw attention to the rising sleep disturbance problem and the increasing need to indulge in highly palatable foods.

1.1 Circadian Rhythm

Circadian misalignment and improper timing of sleep are linked to a variety of diseases and increased risk of illnesses. Circadian rhythms and the rhythmic nature of the world have emerged as significant elements in health and well-being. A growing body of research shows how vital the endogenous circadian clock is for maintaining different aspects of health, including illness risk and control. Circadian rhythms have a crucial role in the pathogenesis and management of a number of mental and metabolic disorders. Living in harmony with these clocks is ideal for maintaining physiological equilibrium and optimal function; modern culture, however, encourages a "24/7" lifestyle in which activity frequently takes place during the body's "biological night," leading to improper sleep timing and circadian misalignment.[3]

TABLE – 1 FREQUENCY AND PERCENTAGE DISTRIBUTION OF CIRCADIAN RHYTHM TYPES IN HEALTHY FEMALES V/s FEMALES DIAGNOSED WITH HYPOTHYROIDISM

Circadian rhythm type	Healthy Females (n=50)	Females with hypothyroidism (n=50)	Overall Value
Definitely morning type	8 (16%)	-	8 (8.0%)
Moderately morning type	13 (26%)	9 (18%)	22 (22.0%)
Intermediate type	23 (46%)	31 (62%)	54 (54.0%)
Moderately evening type	6 (12%)	8 (16%)	14 (14.0%)
Definitely evening type	-	2 (4%)	2 (2.0%)

TABLE – 2 COMPARISON OF THE MORNINGNESS EVENINGNESS QUESTIONNAIRE RESPONSES IN HEALTHY FEMALES V/s FEMALES DIAGNOSED WITH HYPOTHYROIDISM

MEQ Questionnaire	Healthy Females (N,%)	Females with hypothyroidism (N,%)	Overall Value (N,%)	Chi-square test Value	p value
How easy do you find it to get up in the morning (when you are not awakened unexpectedly)?					
[1] Very difficult	7 (14.0%)	7 (14.0%)	14 (45.0%)	12.343	**0.006***
[2] Somewhat difficult	14 (28.0%)	28 (56.0%)	42 (30.0%)		
[3] Fairly easy	17 (34.0%)	13 (26.0%)	30 (15.0%)		
[4] Very easy	12 (12.0%)	2 (6.0%)	14 (10.0%)		
How alert do you feel during the first half hour after you wake up in the morning?					
[4] Not at all alert	5 (10.0%)	7 (14.0%)	12 (12.0%)	7.579	**0.05***
[3] Slightly alert	11 (22.0%)	22 (44.0%)	33 (33.0%)		
[2] Somewhat alert	21 (42.0%)	15 (30.0%)	36 (36.0%)		
[1] Very much alert	13 (26.0%)	6 (12.0%)	19 (19.0%)		

If you had no commitments the next day, what time would you go to bed compared to your usual bedtime?				
[4] Seldom or never later	18 (36.0%)	7 (14.0%)	25 (25.0%)	7.917	**0.048***
[3] Less than 1 hour later	15 (30.0%)	24 (48.0%)	39 (39.0%)		
[2] 1-2 hours later	16 (32.0%)	16 (32.0%)	32 (32.0%)		
[1] More than 2 hours later	1 (2.0%)	3 (6.0%)	4 (4.0%)		

You have decided to do physical exercise. A friend suggests that you do this for one hour twice a week, and the best time for him is between 7-8 AM (07-08 h). Bearing in mind nothing but your own internal "clock," how do you think you would perform?				
[4] Would be in good form	6 (12.0%)	7 (14.0%)	30 (30.0%)	13.033	**0.005***
[3] Would be in reasonable form	11 (2.0%)	10 (20.0%)	30 (30.0%)		
[2] Would find it difficult	10 (20.0%)	13 (26.0%)	24 (24.0%)		
[1] Would find it very difficult	23 (46.0%)	20 (40.0%)	16 (32.0%)		

For some reason you have gone to bed several hours later than usual, but there is no need to get up at any particular time the next morning. Which one of the following are you most likely to do?				
[4] Will wake up at usual time, but will not fall back asleep	15 (30.0%)	8 (16.0%)	23 (23.0%)	7.844	**0.049***
[3] Will wake up at usual time and will doze thereafter	14 (24.0%)	9 (18.0%)	23 (23.0%)		
[2] Will wake up at usual time, but will fall asleep again	12 (24.0%)	25 (50.0%)	37 (237.0%)		
[1] Will not wake up until later than usual	9 (18.0%)	8 (16.0%)	17 (17.0%)		

You have two hours of hard physical work. You are entirely free to plan your day. Considering only your internal "clock," which of the following times would you choose?				
[4] 8 AM–10 AM (08–10 h)	21 (42.0%)	10 (20.0%)	31 (31.0%)	19.206	**0.000***
[3] 11 AM–1 PM (11–13 h)	23 (46.0%)	15 (30.0%)	38 (38.0%)		
[2] 3 PM–5 PM (15–17 h)	4 (8.0%)	7 (14.0%)	11 (1.0%)		
[1] 7 PM–9 PM (19–21 h)	2 (4.0%)	18 (36.0%)	20 (20.0%)		

Suppose you can choose your own work hours. Assume that you work a five-hour day (including breaks), your job is interesting, and you are paid based on your performance. At approximately what time would you choose to begin?

[5] 5 hours starting between 4–8 AM (04–08 h)	-	-	-	15.218	**0.002***
[4] 5 hours starting between 8–9 AM (08–09 h)	21 (42.0%)	8(16.0%)	29(29.0%)		
[3] 5 hours starting between 9 AM–2 PM (09–14 h)	20 (40.0%)	21 (42.0%)	41 (41.0%)		
[2] 5 hours starting between 2–5 PM (14–17 h)	8 (16.0%)	9 (18.0%)	17 (17.0%)		
[1] 5 hours starting between 5 PM–4 AM (17–04 h)	1 (2.0%)	12 (24.0%)	13 (13.0%)		
One hears about "morning types" and "evening types." Which one of these types do you consider yourself to be?					
[6] Definitely a morning type	22 (440%)	12 (24.0%)	34 (34.0%)	9.642	**0.047***
[4] Rather more a morning type than an evening type	13 (26.0%)	10 (20.0%)	23 (23.0%)		
[2] Rather more an evening type than a morning type	9 (18.0%)	12 (24.0%)	21 (21.0%)		
[1] Definitely an evening type	6 (12.0%)	16 (32.0%)	22 (22.0%)		

1.2 Hedonic Hunger

It was discovered that hedonistic hunger was more common in women and that it also declined with aging. Hedonic hunger rose along with body mass index. Hedonic hunger was found to be more prevalent in people who don't exercise frequently, eat snacks at night, and are dieting to lose weight. It has been discovered that people who experience hedonic hunger have strong food cravings, impulsivity, and low self-esteem. [4]

TABLE 3 - COMPARISON OF THE POWER OF FOOD SCALE SCORE BETWEEN HEALTHY FEMALES AND FEMALES DIAGNOSED WITH HYPOTHYROIDISM
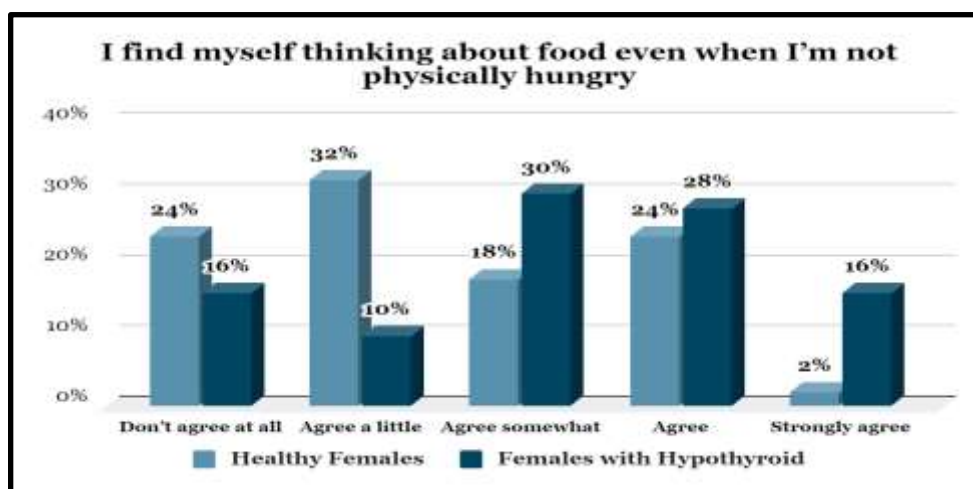
PFS Questionnaire	Healthy Females (n=50)	Females with hypothyroidism (n=50)	Overall Value (n=100)	Pearson correlation test	p value
	I find myself thinking about food even when I'm not physically hungry.				
Don't agree at all **Agree a little** **Agree somewhat** **Agree** **Strongly agree**	12 (24.0%) 16 (32.0%) 9 (18.0%) 12 (24.0%) 1 (2.0%)	8 (16.0%) 5 (10.0%) 15 (30.0%) 14 (28.0%) 8 (16.0%)	20 (20.0%) 15 (15.0%) 21 (21.0%) 26 (26.0%) 9 (.0%)	23.260	**0.0008***
	I get more pleasure from eating than I do from almost anything else.				

Don't agree at all	15 (30.0%)	6 (12.0%)	21 (21.0%)	20.993	**0.001***
Agree a little	11 (22.0%)	10 (20.0%)	21 (21.0%)		
Agree somewhat	17 (34.0%)	18 (36.0%)	35 (35.0%)		
Agree	5 (10.0%)	10 (20.0%)	15 (15.0%)		
Strongly agree	2 (4.0%)	6 (12.0%)	8 (8.0%)		
	If I see or smell a food I like, I get a powerful urge to have some.				
Don't agree at all	11 (22.0%)	2 (4.0%)	13 (13.0%)	17.350	**0.004***
Agree a little	17 (34.0%)	9 (18.0%)	26 (26.0%)		
Agree somewhat	8 (16.0%)	11 (22.0%)	19 (19.0%)		
Agree	10 (20.0%)	17 (34.0%)	27 (27.0%)		
Strongly agree	4 (8.0%)	11 (22.0%)	15 (15.0%)		
	When I'm around a fattening food I love, it's hard to stop myself from at least tasting it.				
Don't agree at all	10 (20.0%)	4 (8.0%)	15 (15.0%)	24.004	**0.000***
Agree a little	15 (30.0%)	8 (16.0%)	23 (23.0%)		
Agree somewhat	8 (16.0%)	5 (10.0%)	13 (13.0%)		
Agree	14 (28.0%)	16 (32.0%)	30 (30.0%)		
Strongly agree	4 (8.0%)	17 (34.0%)	21 (21.0%)		
	It's scary to think of the power that food has over me.				
Don't agree at all	17 (34.0%)	8 (16.0%)	25 (25.0%)	29.326	**0.000***
Agree a little	12 (24.0%)	7 (14.0%)	19 (19.0%)		
Agree somewhat	8 (16.0%)	6 (12.0%)	14 (14.0%)		
Agree	13 (26.0%)	21 (42.0%)	34 (34.0%)		
Strongly agree	0 (0.0%)	6 (16.0%)	8 (8.0%)		
	When I know delicious food is available, I can't help myself from thinking about having some.				
Don't agree at all	7 (14.0%)	2 (4.0%)	8 (8.0%)	18.436	**0.002***
Agree a little	20 (40.0%)	9 (18.0%)	29 (29.0%)		
Agree somewhat	8 (16.0%)	8 (16.0%)	16 (16.0%)		
Agree	10 (20.0%)	23 (46.0%)	33 (33.0%)		
Strongly agree	5 (10.0%)	9 (18.0%)	14 (14.0%)		
	I love the taste of certain foods so much that I can't avoid eating them even if they're bad for me.				
Don't agree at all	7 (14.0%)	2 (4.0%)	8 (8.0%)	21.487	**0.001***
Agree a little	20 (40.0%)	9 (18.0%)	29 (29.0%)		
Agree somewhat	8 (16.0%)	8 (16.0%)	16 (16.0%)		
Agree	10 (20.0%)	23 (46.0%)	33 (33.0%)		
Strongly agree	5 (10.0%)	9 (18.0%)	14 (14.0%)		
	Just before I taste my favorite food, I feel intense anticipation.				
Don't agree at all	10 (20.0%)	0 (0.0%)	10 (10.0%)	13.855	**0.008***
Agree a little	13 (26.0%)	12 (24.0%)	25 (25.0%)		
Agree somewhat	15 (30.0%)	15 (30.0%)	30 (30.0%)		
Agree	10 (20.0%)	17 (34.0%)	27 (27.0%)		
Strongly agree	2 (4.0%)	6 (12.0%)	8 (8.0%)		

	When I eat delicious food I focus a lot on how good it tastes.				
Don't agree at all **Agree a little** **Agree somewhat** **Agree** **Strongly agree**	10 (20.0%) 13 (26.0%) 15 (30.0%) 10 (20.0%) 2 (4.0%)	0 (0.0%) 12 (24.0%) 15 (30.0%) 17 (34.0%) 6 (12.0%)	10 (10.0%) 25 (25.0%) 30 (30.0%) 27 (27.0%) 8 (8.0%)	16.986	**0.005***
	Sometimes, when I'm doing everyday activities, I get an urge to eat "out of the blue" (for no apparent reason).				
Don't agree at all **Agree a little** **Agree somewhat** **Agree** **Strongly agree**	11 (22.0%) 16 (32.0%) 13 (26.0%) 5 (10.0%) 5 (10.0%)	6 (0.0%) 9 (18.0%) 22 (44.0%) 9 (18.0%) 4 (8.0%)	17 (17.0%) 25 (25.0%) 35 (35.0%) 14 (14.0%) 9 (9.0%)	18.862	**0.002***
	I think I enjoy eating a lot more than most other people.				
Don't agree at all **Agree a little** **Agree somewhat** **Agree** **Strongly agree**	12 (24.0%) 17 (34.0%) 9 (18.0%) 11 (22.0%) 1 (2.0%)	6 (12.0%) 11 (22.0%) 13 (26.0%) 17 (34.0%) 3 (6.0%)	18 (18.0%) 28 (28.0%) 22 (22.0%) 28 (28.0%) 4 (4.0%)	22.299	**0.000***
	Hearing someone describe a great meal makes me really want to have something to eat.				
Don't agree at all **Agree a little** **Agree somewhat** **Agree** **Strongly agree**	12 (24.0%) 16 (32.0%) 12 (24.0%) 7 (14.0%) 3 (6.0%)	4 (8.0%) 4 (8.0%) 18 (36.0%) 18 (36.0%) 6 (12.0%)	16 (16.0%) 20 (20.0%) 30 (30.0%) 25 (25.0%) 9 (9.0%)	26.548	**0.000***
	It seems like I have food on my mind a lot.				
Don't agree at all **Agree a little** **Agree somewhat** **Agree** **Strongly agree**	13 (26.0%) 16 (32.0%) 11 (22.0%) 7 (14.0%) 3 (6.0%)	5 (10.0%) 7 (14.0%) 17 (34.0%) 15 (30.0%) 6 (12.0%)	18 (18.0%) 23 (23.0%) 28 (28.0%) 22 (22.0%) 9 (9.0%)	23.002	**0.000***
	It's very important to me that the foods I eat are as delicious as possible				
Don't agree at all **Agree a little** **Agree somewhat** **Agree** **Strongly agree**	11 (22.0%) 14 (28.0%) 10 (20.0%) 12 (24.0%) 3 (6.0%)	2 (4.0%) 7 (14.0%) 16 (32.0%) 21 (42.0%) 4 (8.0%)	13 (13.0%) 21 (21.0%) 26 (22.0%) 33 (33.0%) 6 (6.0%)	19.31	**0.002***
	Before I eat my favorite food my mouth tends to flood with saliva.				
Don't agree at all **Agree a little** **Agree somewhat** **Agree**	12 (24.0%) 20 (40.0%) 5 (10.0%) 9 (18.0%)	8 (16.0%) 13 (26.0%) 13 (26.0%) 13 (26.0%)	20 (20.0%) 33 (33.0%) 18 (18.0%) 22 (22.0%)	19.05	**0.002***

| **Strongly agree** | 4 (8.0%) | 3 (6.0%) | 7 (7.0%) | | |

*p value </= 0.05

FIGURE - 1 COMPARISON BETWEEN TWO GROUPS BASED ON PHYSICAL HUNGER

2.   HYPOTHYROIDISM IN FEMALES

The second most frequent endocrine problem in women is hypothyroidism, which is a condition during which the thyroid gland does not produce sufficient thyroid hormone.[5]. Thyroid hormone is necessary for all metabolically active cells, therefore its absence produces a variety of negative effects. The patient's age, the existence of additional illnesses, and the rate at which hypothyroidism manifests itself all affect the clinical aspects of the condition. Central hypothyroidism is caused by dysfunction of the pituitary (secondary hypothyroidism) or the hypothalamus (tertiary hypothyroidism). [6] The biochemical parameters were collected from the female participants to distinguish between healthy females and females diagnosed with hypothyroidism.

TABLE - 4 BIOCHEMICAL PARAMETERS BETWEEN HEALTHY FEMALES AND FEMALES DIAGNOSED WITH HYPOTHYROIDISM

Biochemical Parameters	Healthy Females (Mean±SD)	Females with hypothyroidism (Mean±SD)	t value	p value
Thyroid hormone stimulating hormone (TSH) value	1.44±0.972	4.78±3.957	-2.463	**0.016***
Triiodothyronine Value (T3/ FT3) value	2.42±1.433	4.00±3.183	3.200	**0.001***
Thyroxine (T4/FT4) value	2.46±1.487	3.19±2.460	-1.753	0.083

*p value </= 0.05

Table 1 depicts the biochemical parameters of the participants with thyroid function tests done. An independent t-test was run and it was found that the mean Thyroid hormone stimulating hormone (TSH) value in healthy females was in the optimal range when compared to females with hypothyroidism which showed a statistically significant difference as seen by the p value of <0.05 . The triiodothyronine levels are also statistically significant as shown by the p value of <0.05 between the two groups.

TABLE - 5 BMI STATUS OF STUDY PARTICIPANTS

BMI RANGE	BMI kg/m^2	Healthy Females	Hypothyroid Females
Underweight	<18.5	-	
Normal	18.5 - 22.9	50 (50%)	9 (18%)
Overweight	23 - 24.9	-	10 (20%)
Obese Class 1	25 - 29.9	-	21 (42%)
Obese Class 2	>30.0	-	10 (20%)

The table depicts that 59% of the female participants belong to the participants with optimal BMI, 10% are in the overweight category whereas 21% and 10% belonged to Obese class 1 and 2 respectively.

3. DIETARY INTAKE

A 24-hour diet recall was administered to the study participants and their intake was assessed. Energy, protein, carbohydrate, fat, total dietary fiber, sodium, potassium, iron and selenium were calculated for all the participants. All of these nutrients are crucial for the functioning of the thyroid gland.

TABLE - 6 MEAN MACRONUTRIENT DIETARY INTAKE OF THE PARTICIPANTS IN STUDY

Nutrient	Healthy Females (n=50)	RDA %	Females with hypothyroidism (n=50)	% RDA	Overall (n=50) Mean (SD)	t value	p value
Energy (kcal)	1326.74 ±441.019	82.88%	1395.36±381.894	87.19%	1361.05±411.875	-0.832	0.408
Carbohydrate (g)	176.24±70.049	88%	180.78±58.797	90.5%	178.51±64.381	-0.351	0.726
Protein (g)	42.46±39.431	93.39%	42.32±16.112	91.3%	42.39±29.968	0.023	0.982
Fats (g)	53.64±30.360	-	51.48±20.436	-	52.56±25.770	0.417	0.677
Total dietary fiber (g)	33.44±31.605	111.33%	27.68±10.615	92.26%	30.56±23.634	1.222	0.225

*p value </= 0.05

TABLE - 7 MEAN MICRONUTRIENT DIETARY INTAKE OF THE PARTICIPANTS IN STUDY

Nutrient	Healthy Females (n=50)	RDA %	Females with hypothyroidism (n=50)	% RDA	Overall (n=50) Mean(SD)	t value	p value
Sodium (mg)	613.88±1110.534	30.7%	575.24±653.135	28.75%	594.76±908.823	0.210	0.834
Potassium (mg)	1519.56±621.865	43.4%	2623.00±4271.76	82.86%	2071.28±3087.18	-1.807	0.074
Iron (mg)	10.88±12.283	37.52%	9.80±6.776	33.79%	9.89±9.9272	1.660	0.149

| Selenium (mg) | 50.68±12.931 | 126.7% | 55.10±30.729 | 137.75% | 51.40±26.498 | 1.700 | 0.151 |

*p value </= 0.05

4. MORNINGNESS EVENINGNESS QUESTIONNAIRE

The morningness-eveningness paradigm is seen as a key indicator of how frequently people will sleep. The MEQ is regarded as the ultimate Circadian Rhythm measurement. One of the most researched individual differences in circadian rhythms in humans is circadian category, which generates continuous variables that may be used to classify individuals into chronotypes (e.g., morning, intermediate, and evening type) with distinguishable morningness-evening-ness (M-E) profiles. [7] A score of 1 through 5 is assigned to each area of the scale. Each component is added together to get the overall score, which is then transformed to a 5-point scale. The scores can range from 16 to 86. A score of 41 or below indicates an "evening type" circadian rhythm preference. Scores of 59 and above indicate "morning types". Scores between 42 and 58 indicate the "intermediate types. [8]

The female participants were divided into two groups of healthy females and females who were diagnosed with hypothyroidism. The assessment of circadian rhythm was done through the use of questionnaires of Morningness Eveningness questionnaire (MEQ).

TABLE - 8 MORNINGNESS EVENINGNESS SCORE OF THE STUDY PARTICIPANTS

	Healthy Females (n=50)	**Females with hypothyroidism (n=50)**	**f value**	**t value**	**p value**
MEQ SCORE	56.12±10.944	48.78±10.359	0.48	3.444	**0.001***

*p value </= 0.05

The scoring is higher in healthy females than females diagnosed with hypothyroidism as they are more inclined towards sleeping late and waking late and also having afternoon naps.

5. POWER OF FOOD SCALE

Hedonic hunger was measured through the power of food scale. 15 questions make up the measure, which evaluates motivation and hunger for appealing meals in three situations:
1) when food is offered but not physically present,
2) when food is physically available but not yet eaten, and
3) when food has been tasted but not yet been ingested. On a 5-point Likert scale, statements are rated from strongly disagree to do not agree at all. A total score and three domain scores serve as the respondent's representation. Food available (items like "I find myself thinking about food even when I am not physically hungry" and "If I see or smell a food I like, I get a powerful urge to have some"), food present (items like "If I taste a food I like, I feel intense anticipation"), and food tasted (items like "Just before I taste a favorite food, I feel intense anticipation) are used to calculate domain scores. Calculating the average over the three domains yields the overall score participants marked the answers according to their responses and behavior. [9]

TABLE - 9 FREQUENCY AND PERCENTAGE DISTRIBUTION OF POWER OF FOOD SCALE DOMAINS BETWEEN HEALTHY FEMALES AND FEMALES DIAGNOSED WITH HYPOTHYROIDISM

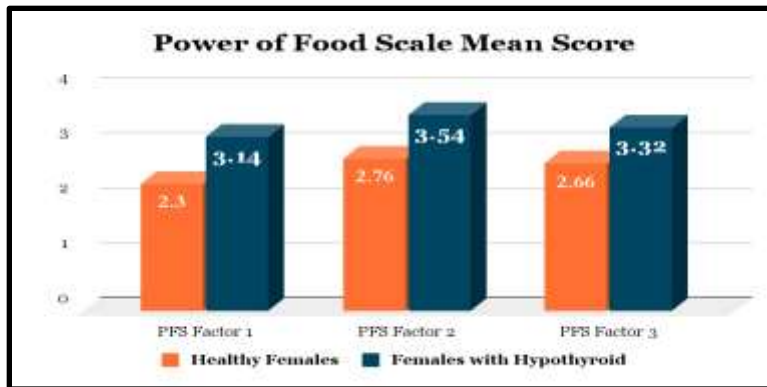| PFS SCORING	**Healthy Females (n=50)**	**Females with hypothyroidism (n=50)**	**t value**	**p value**
PFS Factor 1	2.30±1.035	3.14±0.969	-4.819	**0.000***
PFS Factor 2	2.76±1.117	3.54±0.973	-3.274	**0.000***
PFS Factor 3	2.66±1.154	3.32±0.819	-3.298	**0.001***

*p value </= 0.05

FIGURE - 2 PFS MEAN SCORING AMONG PARTICIPANTS

The Power of food scale scoring is increased in all the three domains among females with hypothyroidism rather than healthy females. This explains the nature towards gaining weight and indulging in highly palatable foods. The healthy females group scored lower on the PFS

TABLE - 10 CORRELATION BETWEEN THE TWO VARIABLES OF CIRCADIAN RHYTHM AND HEDONIC HUNGER

		MEQ SCORE	PFS Factor 1	PFS Factor 2	PFS Factor 3
MEQ SCORE	**Pearson Correlation value**	1	-0.427	-0.403	-0.387
	p value		**0.000***	**0.000***	**0.000****
	N	100	100	100	100
PFS Factor 1	**Pearson Correlation value**	-0.427	1	-0.819	-0.779
	p value	**0.000**		**0.000***	**0.000**
	N	100	100	100	100
PFS Factor 2	**Pearson Correlation value**	-0.403	-0.819	1	-0.747
	p value	**0.000***	**0.000***		**0.000***
	N	100	100	100	100
PFS Factor 3	**Pearson Correlation value**	-0.387	-0.779	-0.747	1
	p value	**0.000***	**0.000**	**0.000****	
	N	100	100	100	100

*p value </= 0.05

There is a significant association between circadian rhythm patterns and hedonic hunger in all three domains of Food Available, Food Present and Food Tasted. If the circadian rhythm shows an intermediate or evening pattern the hedonic hunger tends to increase with it in healthy females.

6. CONCLUSIONS

This is the first study in India that has looked into the association between circadian rhythm and hedonic hunger in healthy females and females diagnosed with hypothyroidism. The current study demonstrates that circadian rhythm disruption is associated with female patients having hypothyroidism. The late circadian rhythm pattern causes an increased hedonic pattern of hunger, poor sleep quality, and inadequate nutritional status. Hedonic hunger measured through the power of the food scale was higher in females diagnosed with hypothyroidism than in healthy females. The circadian rhythm was seen to be optimal in healthy females with respect to sleep and wake-up patterns but the females having hypothyroid were inclined towards late latency to sleep. The results support circadian regulation along with better control over hedonic hunger in thyroid hormones in female patients.

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