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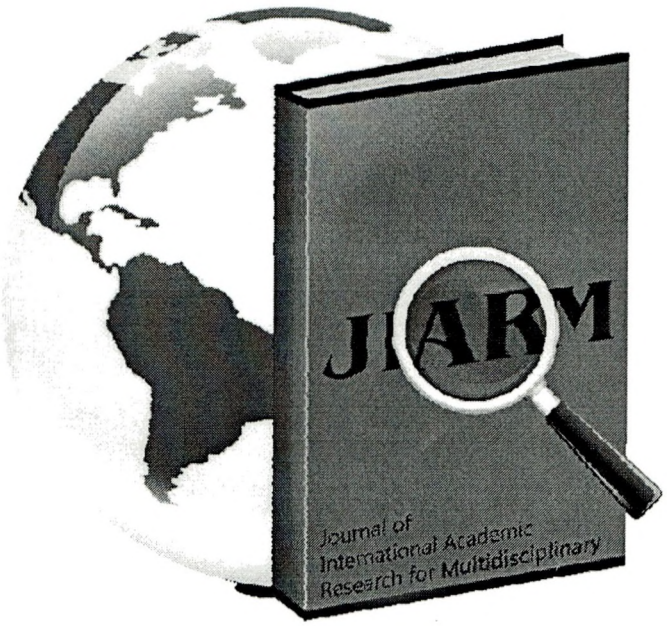

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ATD.EFFECT OF ANTI OBESE BALLS ON SELECTED OBESE ADOLESCENT GIRLS

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INTRODUCTION

Life expectancy is increasing and a great number of people are living longer, because of rapid scientific advancement in food production, liberal availability of food, proper medical care, good hygienic conditions and high standard of living. At the same time, due to faulty eating habits and sedentary life styles, a vast majority of population especially young generation is praying to many health problems and shifted from nutrient deficiency diseases, common in the first half of the 20th century, to concerns about over consumption, poor dietary quality and poor food choices. As a result of rapid socio-economic advancements with peer group compulsion in the recent decades, the adolescent population is undergoing significant lifestyle changes Among the nutritional problems, "Obesity" is booming large and thriving in both developed and developing countries.

Obesity is defined as a condition in which body fat stores are enlarged to such an extent that it impairs health. Obesity is usually the product of both nature and nurture. Heredity, poor eating habits, inactivity and even several other factors also contribute to the occurrence of obesity. Obesity affects over 25 per cent young adults of developed countries and lead to serious health consequences, if it is not treated early.

Cereals and millets are valuable for its carbohydrate and fiber content. Eating a high-fiber meal of cereals and millets is highly good for weight loss. High-fiber foods generally require more chewing time, so a person is less likely to overeat. Also, a high-fiber diet tends to make a meal feel larger and linger longer, stay full for a greater amount of time. (http://health.howstuffworks.com/).

Many herbal spices are known as excellent sources of natural antioxidants and consumption of fresh herbs in the diet may therefore contribute to the daily antioxidant intake. Phenol compounds are the primary compounds present in spices and there is a linear relationship between the total phenolic content, the antioxidant properties and anti-obesity activity of spices. However, there is a need to control the promotion of dangerous and deliberately deceptive approaches to weight loss and control such as special weight loss aids, equipment „miracle cures" and certain drugs and treatments often offered through unauthorized weight loss centers. People are willing to spend large amounts of money for

any kind of treatment that will make them trim and slim. While some methods available are good for health and weight reduction, other methods may be good for weight reduction and not for health. People must therefore be taught to discriminate in the choice of right procedure for weight reduction.

Gopalan (2007) suggested that food based approach is more durable and sustainable than a drug based approach to solve any kind of nutritional problems especially in younger generation.. The specific objectives are to:

- elicit the socio-economic and dietary profile of the selected subjects,
- select and group the subjects for food supplementation
- formulate, analyze and evaluate the anti-obese balls for supplementation and
- Evaluate the effectiveness of food supplementation and nutrition education.

II. Methodology

Phase I. Identification of obese adolescent girls

Identification of obese adolescent girls was carried out by conducting survey among them and assessing parameters relevant for the study, since surveys in general are conducted for collecting general information of any population, institution or phenomena without any hypothesis (Gupta, 2009).

A. Selection of the Locale and the Subjects

The area chosen for the conduct of the study was Avinashilingam University for Women, Coimbatore, Tamil Nadu. A total of 250 adolescent (16-18) years were selected using the simple random sampling technique and is free from sampling bias for the present study. An interview schedule was developed for the collection of information about their socio-economic status and dietary pattern, family history of health status, lifestyle pattern, and psychological perceptions.

B. Identification of Subjects for Supplementation

Among 250 subjects (16 - 18 years), screening for obesity was carried out to select subjects for the research study using the following parameters:

a. Body Mass Index

Obesity was classified on the basis of BMI and subjects with BMI $\geq$30.00 were chosen for the supplementation study.

b. Waist Circumference

Measuring the waist circumference is a good tool for indicating the progress of weight loss. Hence, adolescent girls whose waist circumference exceeds 88 cm were selected

c. Waist-Hip ratio

Morris (2010) revealed that waist-to-hip ratio differentiates between android obesity (apple shape) where there is an accumulation of fat in the abdominal area and gynoid obesity (pear shape) where fat is concentrated in the hip and thighs. Adolescent girls with or exceeding waist-to-hip ratio of 0.8 were selected for the supplementation study.

C. Formulation and Evaluation of Anti-obese balls

Selection of ingredients for formulation of anti-obese balls was mainly based on the culinary uses, medicinal value, health benefits, availability and cost-effectiveness of the foods.

a. Selection of Anti-obese foods

Two cereals, eight millets and three spices were selected for the food based intervention study. They are i) Cereals- Red rice (Oryza sativa/ Sigapu arisi) and Maize (Zea Mays, Makkacholam) ii) Millets- Sorghum (Sorghum Vulgare/ Cholam), Foxtail millet (Setaria italica/ Thenai), Kodo millet (Paspalum scrobiculatum/Varagu), Little millet (Panicum miliare/ Saamai), Barnyard millet (Echinochloa frumentacea/ Kuthiraivolly), Proso millet (Panicum miliaceum/ Panivaragu), Pearl millet (Pennisetum glaucum/ Kambu) and Finger millet (Eleusine cora cana/Ragi). iii) Spices- Cardamom (Elettaria Cardamomum/Elakai), Cinnamon (Cinnamomum zeylanicum /Pattai) and Cloves (Syzygium aromaticum/ Krambu).

b. Formulation Anti-obese balls

Different combination of fiber rich cereals, millets and spices in different variations were formulated to select the best for supplementation to achieve weight loss and are given in Table I.

TABLE- I QUANTITY OF INGREDIENTS USED IN OF ANTI-OBESE BALLS

Food Items	Ingredients	V 1		V 2		V3	
		Quantity		Quantity		Quantity	
		%	gms	%	gms	%	gms
G I	Cereals	40	10	60	15	20	5
Cereals* +	Millets	40	10	20	5	60	5
Millets**	Jaggery	20	5	20	5	20	15
G II	Cereals	70	17.5	75	18.75	77	19.25
Cereals +	Spices	10	2.5	5	1.25	3	0.75
Spices***	Jaggery	20	5	20	5	20	5
G III	Millets	70	17.5	75	18.75	77	19.25
Millets +	Spices	10	2.5	5	1.25	3	0.75
Spices	Jaggery	20	5	20	5	20	5

***Cereals→** Equal Quantities of Red rice + Maize
****Millets→** Equal quantities of Sorgum + Foxtail Millet + Kodo millet + little millet + Barnyard millet + Proso millet + Pearl millet + Finger millet
*****Spices→** Equal quantities of Cardamom + Cinnamon + Cloves

Methods of preparation

The cereals and millets were soaked (separately) in water overnight and drained completely and allowed to sprout and then sun dried for a minimum of six hours. Then the ingredients were ground (preferably by giving in flour mill) to have fine powder, sieved and mildly roasted. The spices were gently roasted (without oil) until aroma is enhanced and then ground to a fine powder form.

D. Evaluation of the Sensory attributes of the anti-obese balls

a) Selection of taste panel members

Sensory evaluation of the anti-obese balls was carried out by a panel of ten members of Food-Science and Nutrition research scholars of Avinashilingam University for Women, Coimbatore, A four point score card was developed for the purpose of evaluation of the acceptance of color, taste, texture and flavor and scores were given according to the degree of acceptance of the anti-obese balls.

b) Acceptability trials of the selected anti-obese balls for supplementation

The best acceptable anti-obese balls were selected for supplementation and analysis of nutrient content, cost and storage stability. Table II shows the quantity of ingredients used in anti-obese ball selected .

TABLE II QUANTITIES OF INGREDIENTS OF ANTI-OBESE BALLS USED FOR SUPPLEMENTATION (Total weight: 25 g/day)

G1V1		G2C3		G3C3	
Ingredients	**Quantity(g)**	**Ingredients**	**Quantity(g)**	**Ingredients**	**Quantity(g)**
Cereals + Millets	20.00	Cereals	19.25	Millets	19.25
		Spices	0.75	Spices	0.75
Jaggery	5.00	Jaggery	5.00	Jaggery	5.00

E. Analysis of Nutrient Content and Cost Effectiveness of the Anti- obese Balls

The best ball was selected for supplementation study and analyzed for its nutrient content like moisture, total ash, energy, protein, fat, carbohydrates, fiber, sodium, potassium, calcium, iron, vitamin C and beta carotene content using standard procedures suggested by NIN Laboratories Manual (2004). Another important aspect in successful food product development is cost effectiveness. The cost of preparation of anti-obese ball was calculated.

Phase III. Effect of Supplementation of Anti-obese balls on Weight reduction

A. Conduct of the supplementation study

Forty girls with BMI ≥30 and parameters like BMI ≥ 30, waist-to-hip ratio ≥ 0.8, and waist circumference ≥88 cm and percent body fat ≥22.5 were selected for the supplementation study. They were grouped into four groups having ten subjects in each group. Experimental

group, I was supplemented with a combination of cereals and millets, II with a combination of cereals and spices and experimental group III with a combination of millets and spices for a period of 60 days whereas control group was kept for comparison without any supplementation. Twenty five gram of anti-obese balls, two in number were given to the subjects and they were instructed to take one ball in morning and another in evening. The groups were monitored throughout the study period

B. Effect of Supplementation on Weight reduction

Effect of supplementation of the anti-obese balls was evaluated before and after the study period by various parameters like weight, height, waist-circumference, hip-circumference; upper arm circumference and Wrist circumference and Body Mass Index and Percent body fat

III. Results and Discussion

B) Parametric profile of the subjects selected for supplementation study

The parametric profile of the selected obese subjects are presented in Table III.

TABLE III PARAMETRIC PROFILE OF THE OBESE SUBJECTS FOR SUPPLEMENTATION (N=40)

Variables	Criteria	Experimental Groups						Control Group (N=10)	
		I (N=10)		II (N=10)		III (N=10)			
		N	%	N	%	N	%	N	%
Body Mass Index *	Pre-Obese (25-29.99)	-	-	-	-	-	-	1	10
	Obese Class I (30-34.99)	9	90	2	20	10	100	9	90
	Obese Class II (35-39.99)	1	10	7	70	-	-	-	-
	Obese Class III (≥40)	-	-	1	10	-	-	-	-
	Total	**10**	**100**	**10**	**100**	**10**	**100**	**10**	**100**
Waist Hip Ratio ** (For women)	Average risk (0.80-0.85)	7	70	7	70	6	60	7	70
	High risk (0.85 - 0.90)	3	30	3	30	4	40	3	30
	Extreme risk (> 0.90)	-	-	-	-	-	-	-	-
	Total	**10**	**100**	**10**	**100**	**10**	**100**	**10**	**100**
Waist Circumference (For women)	Normal (≤88cm)	2	20	3	30	9	90	8	80
	Risk (>88cm)	8	80	7	70	1	10	2	20
	Total	**10**	**100**	**10**	**100**	**10**	**100**	**10**	**100**
Percent Body Fat (For < 19 yrs girls)***	Good (17.5-22)	2	20	2	20	8	80	4	40
	Moderate (22.5-27)	5	50	5	50	2	20	4	40
	Overweight (27.5-32)	2	20	-	-	-	-	1	10
	Obese (>32.5)	1	10	3	30	-	-	1	10
	Total	**10**	**100**	**10**	**100**	**10**	**100**	**10**	**100**

[*- (WHO, 2004); **- http://www.topendsports.com/testing/tests/WHR.htm;

***-(Hoeger and Hoeger, 2009)]

Majority of the subjects selected for the supplementation study belonged to Obesity Class I with BMI range of 30 - 34.99 and had an average risk for diseases according to their waist-to-hip ratio. Majority of them had acceptable levels of per cent body fat.

C. Sensory evaluation of anti-obese balls

Sensory evaluation of different combinations of anti-obese balls in different variations was conducted to find the best product for supplementation.

D. Effect of supplementation of anti-obese balls

The effect of the supplementation of anti-obese balls on experimental groups was compared with control group in the aspect of anthropometric measurements and is presented in Table VII.

TABLE VII EFFECT OF SUPPLEMENTATION OF ANTI-OBESE BALLS

Anthropometric measurements	Expt. Groups Vs Control group	Mean ± Standard Deviation		Mean difference	't' value
		Experimental Groups	Control Group		
Weight (kg)	Group-I	3.25±2.4181	0.50± 0.4082	2.75	3.7804*
	Group-II	2.10±0.7379		1.60	6.8571*
	Group-III	2.35±0.4743		1.85	11.044*
Waist circumference (cm)	Group-I	3.20±2.1370	0.75± 0.6346	2.45	3.8095*
	Group-II	2.40±0.2108		1.65	6.3772*
	Group-III	2.15±0.3375		1.40	6.7254*
Hip circumference (cm)	Group-I	1.95±0.6852	0.55± 0.3689	1.40	6.00*
	Group-II	3.20±3.4737		2.65	2.3859**
	Group-III	2.15±1.1068		1.60	1.1466*
Upper-arm circumference (cm)	Group-I	2.25±0.8898	0.45± 0.4378	1.80	5.0138*
	Group-II	3.25±1.7038		2.80	5.0562*
	Group-III	2.25±0.9204		1.80	5.5114*
Wrist circumference (cm)	Group-I	1.1±0.6992	0.00± 0.00	1.1	4.9749*
	Group-II	0.80±0.6749		0.80	3.7482*
	Group-III	1.20		1.20	5.0410*

*-Significant at 1 % level ; **-Significant at 5 % level ; NS-Not Significant

From Table VII, it is evident that there was a significant reduction in mean values of the anthropometric measurements such as weight, waist circumference, hip circumference, upper arm circumference and wrist circumference of the experimental groups when compared with the non- supplemented control group.

Experimental Group I Vs Control group- The mean values from the Table XXII indicates that there is a significant reduction in the weight, waist, hip, upper-arm and wrist circumference of the experimental group I which was supplemented with cereals and millets, at 1 per cent

level when compared to control group. These statistical interpretations clearly indicates that the anti-obese balls of the cereals and millet combination had an effective effect on the body weight and related measurements because of their fiber content and are considered as an effective supplement for obesity management.

Experimental Group II Vs Control group- Experimental group II was supplemented with the combination of cereals and spices and experimental group II had significant effect on all the measurements of weight, upper-arm and waist circumference, where the reduction in the mean values was observed at 1 per cent levels and hip circumference, where the reduction was observed at 5 per cent level of significance. The effect of supplementation was mainly due to the fibre content of the cereal and antioxidant and fat burning ability of the spices.

Experimental Group III Vs Control group- Anti-obese balls with a combination of millets and spices were supplemented to experimental group III and the effect of the supplement, as reduction in certain measurements was observed in terms of body weight, waist, hip, upper-arm and waist circumference at one per cent level of significance. The remarkable reduction is due to the fibre content of cereals and millets and fat burning activity of spices.

CONCLUSION

A food based nutrition intervention, being harmless and capable of reducing body weight in a positive way is considered to be one among the most reliable methods of combating obesity and maintaining good health. Hence, it is essential to include anti-obese foods constantly in the regular diet for achieving and maintaining healthy and desirable body weight. Nutrition education highlighting the nutritional significance and health benefits of fibre rich food has an important role to play in reducing overweight and obesity and prevent the further occurrence of obesity.

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