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Effect of Spirulina Supplementation on Hemoglobin Level of Anaemic Young Women

Nalwade Vijaya M.*, Uphade Rohini B.**

Abstract

The present study was undertaken to study the effect of spirulina supplementation on blood haemoglobin level of the selected young women. Sixty anaemic young women were selected for the study and they were divided into two groups, as experimental group (30) and control group (30). Nutritional status of the selected young women was assessed by recording anthropometric measurement and biochemical examination before and after supplementation. Spirulina capsules were prepared for the intervention Programme by filling 500 mg. of spirulina powder in each capsule. Total four capsules of spirulina of two g/d were provided as a supplementation to the selected anaemic young women, for a period of 90 days. Results showed that, body weight of the selected young women of experimental group was increased from 49.86 to 50.63 kg and Body Mass Index from 22.3 to 22.4 after supplementation of spirulina, however it was not statistically significant. It was found that blood haemoglobin level of the selected young women of experimental group was increased from 9.5±1.28 to 11.01±0.92g/dl after the spirulina supplementation, which was significant statistically. It indicates that consumption of spirulina is helpful in overcoming the prevalence of anaemia in the community especially vulnerable sections of population.

Keywords: Spirulina; Supplementation; Hemoglobin; Young Women.

Introduction

Anaemia is a major global problem affecting 20-70 per cent of the population in various countries. In India, it is an important public health problem affecting people from all walks of life particularly in preschool, school children and pregnant women because of high prevalence (50-70%) and the adverse functional consequences.

Spirulina is a simple one celled form of blue green algae that is widely produced and commercialized as dietary supplement for modulating immune functions, as well as ameliorating a variety of diseases. Spirulina is a rich source of micronutrients and antioxidants. It is one of the few non animal sources of vitamin B12 which makes it an excellent addition to the vegetarian diet. Spirulina has a higher percentage of protein (60%) than any other food. (Venkataraman, 1993).The total iron content of spirulina is 89 mg/100g. Apart from containing high bio-chelated iron, spirulina also contains appreciable amount of calcium, magnesium, copper, chromium and selenium and vitamins namely vitamin B12, folic acid and vitamin B6 which are essential for haemopoiesis. Chlorophyll provides the green pigment and is known as the 'blood of plants' because as it's similarity in structure to haemoglobin in human blood. Japanese research has shown positive results using spirulina to treat anaemia, partially attributed to the hypothesis that chlorophyll will convert to haemoglobin if ingested with sufficient iron(Carmel, 2008).

Anaemia has multiple adverse effects on human function. Severe anaemia during pregnancy is thought to increase the risk of maternal mortality. Pregnancy anaemia has been reported to be associated with preterm delivery and a subsequently LBW in many studies. Beside this, anaemia has long been known to impair work performance, endurance and productivity. As it has become increasingly apparent that it is difficult, if not impossible, to correct anaemia fully by iron treatment during pregnancy alone, more

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attention is being paid to the need to provide young women with either daily, or weekly, low dose iron supplements. This strategy may prevent them being anaemic and iron deficiency when they become pregnant. So the present investigation was undertaken to know the impact of supplementation of spirulina on haematological status of young women.

Methods

Preparation of Spirulina Capsules

Empty capsules capacity of 500 mg was purchase from market. Exact amount of 500 mg of spirulina powder was filled in the empty capsule in hygienic condition. Filled capsules were kept in Zip lock plastic bags till end of the experiment. Four spirulina capsules each containing 500 mg of spirulina powder was supplemented (2 g per day) to the selected young women of experimental group for a period of 90 days. They were advised to take these capsules four times a day, each at breakfast, lunch, snacks, and dinner.

Selection of Subjects and Collection of Data

A total of 100 young women of 20 to 25 years of age form different girls hostel of Vasantrao Naik Marathawada Krishi Vidyapith, Parbhani of Maharashtra state were randomly selected and screened for blood haemoglobin level. From these, 60 anaemic young women were selected. They were equally divided into two groups as experimental (30) and control (30). All the selected young women were personally interviewed by the investigator with the help of a pretested questionnaire to collect the information on socio-economic background, family size, education and occupation of parents.

Anthropometric Measurements

Nutritional status of all the selected young women was assessed by determining body weight (kg) and height (cm) and by calculating the values of body mass index. The measurements of body weight and height for each respondent were recorded by following the standard techniques given by Jelliffe (1966).

Estimation of Haemoglobin Level

Haemoglobin content in the blood of selected young women before and after supplementation was estimated by cyanomethaemoglobin method of (Crosby *et al*., 1954) using a filter paper technique. The data obtained from the experiment such as hemoglobin level was subjected to statistical analysis (Panse and Sukhatme, 1985).

Results and Discussion

The present investigation was undertaken to study the effect of spirulina supplementation on the blood haemoglobin level of the selected young women.

Out of 60 selected young women, 56.66 per cent were belonging to 18 to 20 years of age group and the remaining 40 per cent were from 21 to 24 years of age group, only 3.33 per cent were belonging to > 24 years of age. A relatively very high per cent (86.66) of young women were belonging to nuclear families and only 13.33 per cent young women were belonging to joint families. Fifty five per cent of young women had monthly family income of Rs. ≤ 10,000 and 28.33 per cent found to have monthly family income of Rs. ≥ 10,000 to 20,000 and the remaining 16.66 per cent were belonging to monthly family income of Rs. > 20,000.

It was found that 15, 35 and 50 per cent fathers of the selected subjects were middle school educated, high school and graduate respectively. Majority (43.33 %) of subject's mother had education up to high school and the remaining 40 per cent were completed the middle school education. Fathers of the selected young women had occupation as farming (28.3%), service (55%), farming and business (3.3%) and business (10%). A relatively very high (95) per cent mothers were homemaker while only five per cent were doing service (Table 1).

Anthropometric measurements of young women of experimental and control group before and after supplementation of spirulina are given in Table 2. The mean value of the body weight (kg) of young women belonging to experimental group before supplementation was 49.86 ± 4.42 kg and it was ranged from 40.5 to 58.5 kg whereas after supplementation of spirulina capsule for 90 days it was 50.63 ± 4.03 kg. It was found that body weight of the selected young women of experimental group was increased by ¾ kg and 200 g increase in control group but the increment in the weight was not significant. The mean value of Body Mass Index (BMI) of experimental group before supplementation was 22.30 ± 2.22 and it was ranged from 18 to 26 whereas after supplementation for 90 days it was 22.48 ± 2.16. The results indicated that Body Mass Index (BMI) value of the selected subjects of experimental group

was slightly increased but it was not significant statistically. A slight increase (0.06) in BMI of the young women of control group was also noticed. In conclusion, it can be said that though the slight increase was noticed in the body weight and BMI value of the selected young women, it was not significant statistically.

The categorization of the selected young women of experimental and control group into different grades of under nutrition on the basis of BMI is presented in Table 3. Initially maximum (83.33) per cent of young women belonging to experimental group found to be normal followed by (16.66) mild under nourished and moderate under nourished (13.33) whereas, after supplementation of spirulina for 90 days, there was increase in per cent of normal (86.66) and decrease in mild under nutrition. On the other hand,76.66 per cent young women of control group were normal, 23.33 per cent were mild undernourished and only one young woman found to be moderate under nourished. None of the young women of experimental group was under the category of moderate and severe under nutrition.

Mean value of haemoglobin content in the blood of the selected young women is given in the Table 4. Wide variation was noticed in haemoglobin content of the blood of the selected young women belonging to experimental group. It ranged from 7 to 11 g/dl with an average value of 9.5±1.28 g/dl before the supplementation of spirulina which was found to be increased significantly after 90 days of spirulina supplementation (11.01±0.92 g/dl). On the other hand, mean value of haemoglobin content in the blood of control group of young women was 9.74 ±1.39 g/dl initially, but at the end of the experiment it was decreased (9.72±1.31 g/dl). From the above findings it can be inferred that supplementation of spirulina for 90 days to the selected young women of experimental group resulted in significant improvement in the haemoglobin level. The results of the present study are in line with the findings of Mani *et al.,* (2000), Thirumani and Uma (2005), Judhiastuty *et al.,* (2002). They reported that supplementation of spirulina to the anaemic adolescent girls resulted in significant improvement of haemoglobin level. Even the study conducted by Mahalakshmi (2000) and Mane (2011) on supplementation of spirulina to the elderly indicated that significant elevation in blood haemoglobin level of elderly.

Prevalence of anaemia among the selected young

Table 1: Socio-economic status of the selected young women

S. No.	Particulars	Selected young women	
		Number	Per cent
1	**Age (years)**		
	18 to 20	34	56.66
	21 to 24	24	40
	> 24	2	3.33
2	**Type of family**		
	Nuclear	52	86.66
	Joint	8	13.33
3	**Monthly family income**		
	≤10000	33	55
	>10000 to 20000	17	28.33
	≥20000	10	16.66
4	**Educational level of Father**		
	Illiterate	-	-
	Middle school	9	15
	High school	21	35
	Graduate	30	5
5	**Educational level of Mother**		
	Illiterate	6	10
	Middle school	24	40
	High school	26	43.33
	Graduate	4	6.66
6	**Occupation of Father**		
	Farming	17	28.33
	Service	33	55
	Farming and business	2	3.33
	Business	6	10
	Labor	2	3.33
7	**Occupation of mother**		
	Farming	-	-
	Service	3	5
	Business	-	-
	Homemaker	57	95

Table 2: Anthropometric measurements of young women of experimental and control group before and after supplementation of spirulina

Anthropometric measurements	The mean value of different anthropometric measurements of the selected young women					
	Experimental group			Control group		
	Initial	Final (90 days)	't'value	Initial	Final (90 days)	't'value
Height (cm)	153.03 ±7.04 (141 - 165)	153.03 ± 7.04 (141 - 165)	-	150.83 ± 4.2 (141 - 165)	150.83 ± 4.2 (141 - 165)	-
Weight (kg)	49.86 ± 4.42 (40.5 – 58.5)	50.63 ± 4.03 (40 – 58.5)	0.70NS	45.4± 4.49 (38 - 51)	45.6 ±4.61 (39 - 53)	0.7N
BMI	22.3 ±2.22 (18-26)	22.48 ±2.16 (18- 26)	0.32 NS	20.39 ±1.49 (17- 22)	20.45 ±1.54 (17- 22)	0.15NS

NS – Non Significant
Figures in parenthesis indicate range

Table 3: Categorization of the selected young women of experimental and control group into different grades of under nutrition on the basis of BMI

S. No.	BMI Category	Control		Experimental	
		Initial	Final (90 days)	Initial	Final (90 days)
1	Normal	22(73.33)	23(76.66)	25(83.33)	26(86.66)
2	Mild under nutrition	7 (23.33)	6 (20)	5(16.66)	4(13.33)
3	Moderate under nutrition	1(3.33)	1(3.33)	-	-
4	Severe under nutrition	-	-	-	-

Figures in parenthesis indicate percentage

Table 4: Mean haemoglobin content in the blood of the selected young womenbefore and after supplementation of spirulina

Particulars	Haemoglobin content of blood (g/dl) of the selected young women					't' value
		Initial		Final (90 days)		
	Number	Range	Mean± SD	Range	Mean ± SD	E Vs C
Experimental group	30	7 - 11	9.5±1.12	9 - 12	11.01±0.92	4.39**
Control group	30	7 - 12	9.7±1.39	7 - 12	9.72±1.31	0.05 NS

** Significant at 1% level, NS- non significant

Table 5: Prevalence of anaemia among the selected young women before and after supplementation

S. No.	Degree of anaemia	Experimental (N=30)		Control (N=30)	
		Initial	Final 90 days	Initial	Final 90 days
1	Normal	-	3(10)	1(3.33)	2(6.66)
2	Mild	13(43.33)	21(70)	12(40)	11(36.66)
3	Moderate	17(56.66)	6(20)	17(56.66)	17(56.66)
4	Severe	-	-	-	-

Figures in parenthesis indicate percentage

women before and after supplementation is presented in Table 5.

Among the selected anaemic young women belonging to experimental group, maximum number (17) had moderate degree of anaemia while minimum number (13) were having mild degree of anaemia. None of them was found to be under the category of normal before supplementation.

On the other hand, the selected young women belonging to control group, 12 found to be having mild degree of anaemia, 17 had moderate degree of anaemia and one was normal before supplementation. After supplementation of spiruina for 90 days, 3 young women found to be normal, 21 were having mild degree of anaemia and 6 were having moderate degree anaemia while, in control group 2 young women found to be normal, 11and 17 were noticed to be under the category of mild and moderate degree of anaemia.

Spirulina has a blend of nutrient that no single plant source. It provides highest amount of protein (65-71%), high level of carotene and iron. These nutrients play a major role in formation of haemoglobin.

Beside this, iron in a spirulina is 60% better absorbed than ferrous sulphate and other

complements consequently.

On the whole, results indicated that supplementation of spirulina was beneficial in overcoming moderate degree to mild and mild to normal degree of anaemia among young women belonging to experimental group. In nutshell, it can be said that spirulina was helpful in reducing the prevalence of anaemia.

Similar observations were made by Uliayar*et al.,* (2000) and Jidhiastity*et al.,* (2002) that spirulina was effective in combat iron deficiency anaemia.

Conclusion

Results of the present study showed that body weight and Body Mass Index of the selected young women of experimental group was increased after supplementation of spirulina but it was not statistically significant.

After the supplementation of spirulina powder, more number of anaemic young women who were previously belonging to the mild under nutrition category, shifted to normal category thus there was per cent increase in the normal category of young women at the end of the experiment. Results inferred that the haemoglobin content of blood of the selected young women belonging to experimental group were significantly increased after supplementation of spirulina for 90 days.

Even prevalence of anaemia was decreased. In conclusion, supplementation of spirulina powder found to be helpful in reducing the prevalence of anaemia among the young women. Hence consumption of spirulina can be encouraged to overcome prevalence of anaemia among vulnerable sections of population.

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Study of Shell, Meat and Moisture Separation from Fresh Acetes

Ajay E. Sonavane*, V.R. Joshi*

Abstracts

An attempt has been made in present study to separation of the *Acetes* meat free of shell, meat and moisture. Acetes shrimp is available year round in whole dried from in the market. As per the prevailing practice, jawala is sundried on the beach and sold in the dried form for human consumption in the domestic market. However, functional properties of protein in fresh *Acetes* are lost after it is dried.Hence, this necessitates the use of *Acetes* in fresh conditionso as to utilize all the functional properties of *Acetes* protein to the maximum extent. Fresh meat of *Acetes* can be used for the preparation of *Acetes* mince thereby retaining their desired functional properties. Similarly, the product can be prepared from fresh Acetes meat.

Keywords: *Acetes;* Crustacea; krill; Baddar.

Introduction

The members of *Acetes* species popularly known as 'Paste shrimp' belong to the family Sergestidae of class Crustacea. Locally known as Jawala in India, most of the *Acetes* shrimp is landed along the north west coast, i.e. in the states of Gujarat and Maharashtra. During the year 2011-12, about 1, 64,951 tons of non-penaeid prawns were landed along the Indian coast (CMFRI, 2012). Attempts have been made to separation of meat from Acetes,Patil (2000) employed five different methods for isolation of flesh from jawala such as separation of flesh by heating, centrifugation, isoelectric focusing, dense phase separation, pulverization by using Rovisapulverizer and meat separator. Among these, in dense phase separation method the yield of meat was 70.16% at 10%salt concentration. In the case of 9% and 11% salt concentration there was partial separation, whereas at 7% and 13% salt concentration there was no separation. The meat yield in Rovisapulverizer was 53% and in meat separator it was 12.20%. Attempts have been made to Separation of meat from krill. Lagunov *et al*. (1974) tried to separate the meat from krill. Krill was pressed to get juice, which was later coagulated and frozen at -32°C. This required lengthy procedure and costly equipments. Rehbein (1980) prepared krill meat from fresh krill by means of a roller peeler originally designed for the shrimp industry. After separation from the shells, the meat was washed with freshwater and in part supplied with additives. Because of the high water content of krillmeat, powders of polyphosphates or solid salts of organic acids were thoroughly mixed with the meat, and then the meat were frozen in plate freezer and stored at -30°C. Christian (1980) separated the flesh from Antarctic krill by using Baddar bone separator.

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Materials and Methods

The fresh *Acetes* immediately after catch was procured from Harne landing centre of Ratnagiri and chilled and transported to College of Fisheries, Ratnagiri. This was thawed and by catch fishes, other animals and plants were removed and *Acetes* was subjected to the following treatment of separation of shell from fresh Acetes. Whole *Acetes* was weighed and subjected to shell separation by putting in meat separator of Baddar 600 make was used to separate the meat and shell. The size of holes of the perforated drum was 3 mm.Then the separated meat was subjected to squeezing in the thin synthetic cloth to

remove excess liquid (Moisture+Solids). The separated meat, shell and liquid were weighed. The samples obtained at each stages of the process were subject to analysis for the content of moisture, shell and meat.

Result and Discussion

Proximate composition of whole *Acetes* and squeezed separated *Acetes* meat had low fat content 1.0 to 2.4% and high moisture content between 84.2 and 77.03% respectively.

Protein content of fresh whole *Acetes* and squeezed separated *Acetes* meat were 12.08 and 16.87% and ash content of fresh whole *Acetes* and squeezed separated *Acetes* meat were 2.72 and 2.34% respectively (Table 1 and Figure 1 & 2). The percentage yield of separated Acetes meat was found to be 65.23% and residual shell was 30.47%.

Further after squeezing in thin nylon cloth, the yield of squeezed Acetes meat was found to be 42.01% and squeezed Acetes liquid was found to be 19.97%.The squeezed *Acetes* meat had 76.5% of moisture and reduced shell content of 0.4% where as squeezed *Acetes* liquid had 91.2% of moisture and reduced meat content of 8.8%.

It was observed that 65.25% of separated Acetes meat and 30.47% of residue shell was obtained after passing the drained whole Acetes through the meat separator (diameter of wholes on the drum being 3 mm) Table 2 and Figure 3. Further on squeezing after separated Acetes meat in thin synthetic cloth, 42.01 % of squeezed separated Acetes meat and 19.97 % squeezed Acetes liquid were obtained. Similarly Nagothkar (2013) reported meat yield of 64.44% and shell yield of 31.52 % further Suzuki (1981) also reported yield of krill meat 63.8 % and shell yield of 24.1% while separating by paule deboner. The moisture content of the separated Acetes meat, separated shell, squeezed Acetes meat and squeezed Acetes liquid were found to be 81.1%, 39.4%, 76.5% and 91.2% respectively.

The meat content of the separated Acetes meat, separated shell, squeezed Acetes meat and squeezed Acetes liquid were found to be 18.5 %, 14.4 %, 23.6 % and 8.8% respectively. The shell content of the separated Acetes meat, separated shell, squeezed Acetes meat and squeezed Acetes liquid were found to be 0.4%, 46.2%, 23.6% and 0% respectively.

Table 1: Proximate composition of raw *Acetes*

Sample / Proximate composition	Whole Acetes	Squeezed separated Acetes meat
Moisture (%)	84.2	77.03
Protein (%)	12.08	16.87
Crude fat (%)	1.0	2.40
Ash (%)	2.72	2.34

Table 2: Percentage yield Acetes meat, shell and liquid

Sr. No	Sample	Yield (%)
1.	Cleaned whole *Acetes*(CWA)	99.53
2.	Waste	0.47
3.	Drained liquid (DL)	18.05
4.	Drained whole *Acetes* (DWA)	79.98
5.	Separated Acetes meat (SAM)	65.23
6.	Residue shell (R shell)	30.47
7.	Squeezed *Acetes* meat (SQAM)	42.01
8.	Squeezed *Acetes*liquid(SQAL)	19.97

Table 3: Percentage of moisture, meat and shell at different stages

Particulars	Moisture (%)	Shell (%)	Meat (%)
Cleaned whole *Acetes* (CWA)	84.2	6.4	9.4
Drained whole *Acetes* (DWA)	82	6.4	11.6
Separated Acetes meat (SAM)	81.1	0.4	18.5
Residue shell (R shell)	39.4	46.2	14.4
Squeezed *Acetes* meat (SQAM)	76.5	0.4	23.6
Squeezed *Acetes*liquid(SQAL)	91.2	0	8.8

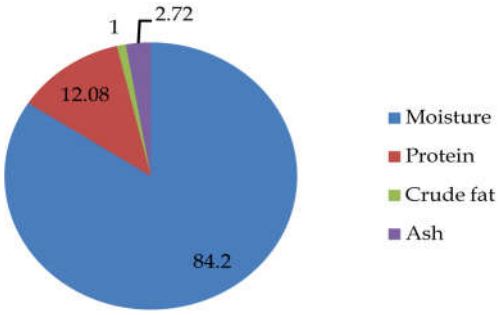

Fig. 1: Proximate composition of whole *Acetes*

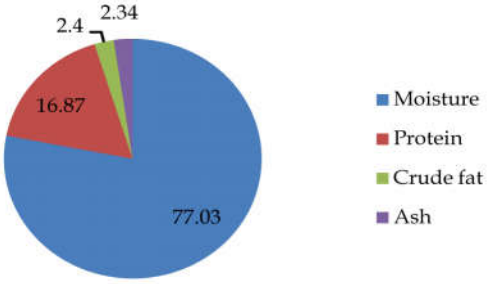

Fig. 2: Proximate composition of squeezed separated Acetes meat

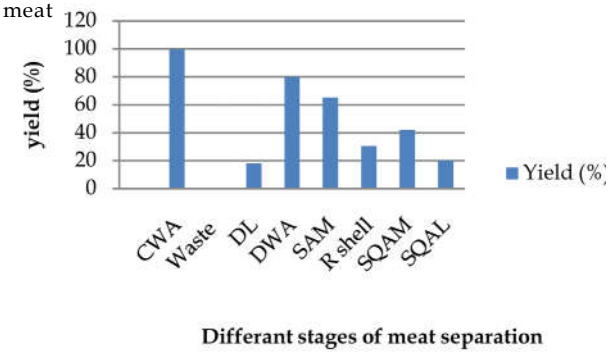

Fig. 3: Percentage yield Acetes meat, shell and liquid

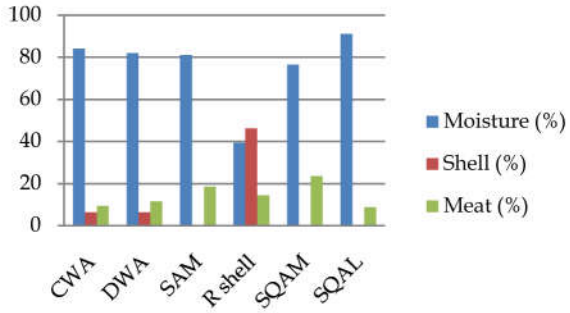

Fig. 4: Percentage of moisture, meat and shell at different stage

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Note: Cleaned whole *Acetes* (CWA), Drained whole *Acetes* (DWA), Separated Acetes meat (SAM), Residue shell (R shell), Squeezed *Acetes* meat (SQAM), Squeezed *Acetes* liquid (SQAL).

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Impact of Nutrition Education on Nutritional Knowledge of Care: Givers of Preschool Children of Jorhat, Assam

Baruah Urmimala*, Bhattacharyya Ruma**

Abstract

The present study has been conducted to impart nutrition education to the care-givers of children (4-6 Years) of Jorhat, Assam. Nutrition education was imparted to the care-givers of the target children with the help of suitable teaching aids on aspects related to basic five food groups, nutritional deficiency disorders in order to improve the nutritional knowledge of the respondents. Prior to imparting nutrition education, the nutritional knowledge of the respondents was assessed by administering a knowledge scale. The pre-exposure knowledge level of the respondents revealed that 42.5 per cent of the respondents had low level of knowledge regarding nutritional aspects of basic five food groups whereas 45 per cent had very low knowledge regarding nutritional deficiency disorders. The difference between mean pre-exposure knowledge scores and mean post exposure knowledge scores of the respondents were significant regarding all aspects, which indicated a significant gain in knowledge ($p<0.05$). The results indicated that the nutrition education imparted to the care-givers of the target children had an impact in terms of gain in knowledge which is a reflection of successful implementation of the nutrition education intervention aimed at inculcating good nutritional care and practices to the care-givers for all round development of the pre-school children.

Keywords: Nutrition Education; Pre-Exposure; Post-Exposure.

Introduction

Nutrition Education is any combination of educational strategies, accompanied by environmental supports, designed to facilitate voluntary adoption of food choices and other food and nutrition- related behaviours conducive to health and well-being (Jones *et al*., 2007). The main goal of nutrition education is to encourage the community to opt for healthy foods and healthy life style rather than unhealthy ones which may lead to various health disorders and non-communicable diseases. Nutrition education is required at each and every step of life, yet proper knowledge of nutritional facts behind food is of utmost importance to the care-givers at home i.e. the mothers for appropriate nutritional care of the vulnerable groups per se i.e. the pre-schoolers. A child's informal nutrition education starts from the very beginning from the home itself. Parents and especially the mother are responsible for developing in the growing child proper eating habits and desirable attitude towards nutrition. Imparting nutrition education to the mothers helps to improve the dietary status of the family as mother's concept about balanced diet and how to provide it, can be changed. With the improvement in nutritional knowledge of the mothers, nutritional status of children also improves (Sharma *et al*., 2005). Therefore, the present study has been carried out to impart nutrition education to the mothers or care-givers of the 4-6 years children of Jorhat, Assam.

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Materials and Methods

In the present investigation, an attempt has been made to impart nutrition education to the care-givers of 4-6 years boys and girls. The purpose behind nutrition education intervention to the care-takers i.e.

the mothers/parents and school teachers is to impart appropriate nutrition information on inclusion of food from basic five food groups, selection of foods, making food choices which are nutritious. Proper nutrition information on balanced meal for pre-school or 4-6 years children and as their foods likes and dislikes governs their meal pattern, food habits which will eventually contribute to this age groups growth and development and academic persuits. For the study, a three point knowledge scale was adopted and modified as followed by Saho (1997) for the study which consisted of statements that mainly dealt with knowledge of the respondents regarding basic five food groups and nutritional deficiency disorders. The statements were then put into three point response categories namely 'correct', 'incorrect' and 'do not know', with the scores 2,1 and 0 respectively.

Prior to nutrition education, the prepared knowledge scale was administered on the care-givers of the target children to assess the nutritional knowledge of the respondents regarding aspects of five food groups and nutritional deficiency disorders. After assessing the nutritional knowledge, nutrition education was imparted to the care-givers' in the respective schools with prior permission from the head of the institution. The care-givers' were divided into group of 50 members and nutrition education was given separately to each group. To be effective, nutrition education must be in local language, keeping this in mind the whole nutrition education programme was conducted in Assamese language. Nutrition education was imparted using suitable visual aids like power point presentation, recipe booklet were used in combination with lecture, live demonstration on preparation of nutritious snacks for preschool children and discussion method (Plate 1-4). Finally, the same knowledge scale was administered to assess the gain in knowledge of the care-givers after the nutrition education intervention after a interval of 7 days.

Plate 1: Imparting nutrition education to the care – givers (mothers)

Plate 2: Imparting nutrition education to the care – givers (mothers)

Plate 3: Recipe demonstration

Plate 4: Distributing booklet to the care-givers(mothers)

Results and Discussions

The present study was undertaken to impart nutrition education to care-givers of 4-6 years children. The nutritional knowledge of the care-givers was assessed before and after imparting nutrition education. The results obtained in the present investigation are presented and discussed under suitable headings.

Level of Existing Knowledge of the Respondents

The existing knowledge of the mothers regarding basic five food groups and nutritional deficiency disorders were assessed by administering a knowledge scale and the results are presented below.

Existing knowledge level of the respondents regarding basic five food groups

The existing knowledge of the respondents regarding basic five food groups were assessed by administering a knowledge scale on what are basic five food groups, importance of basic five food groups in the daily diet, sources of each food group and nutrients present in them. The existing knowledge level of the mothers regarding basic five food groups is depicted in Figure 1.

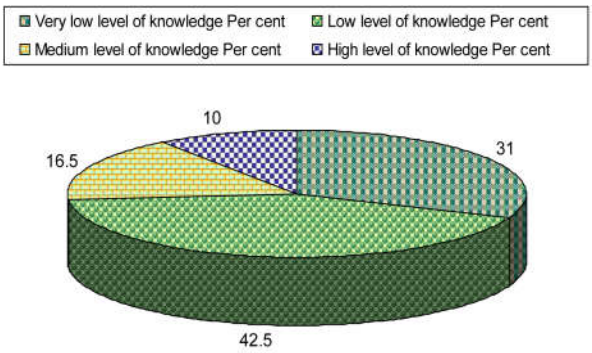

Fig. 1: Per cent distribution of respondents according to their existing knowledge on basic five food groups Respondents (N=200)

Figure 1 reveals that 31 per cent of the mothers had very low level of knowledge, followed by 42.5 per cent who had low level of knowledge, while 16.5 per cent of them had medium level of knowledge and 10 per cent had high level of knowledge. Study done by Bharali (2000) in four villages of Jorhat district stated that majority of the rural women had medium level of existing knowledge on nutrition. Borbora (2002) assessed the nutritional knowledge of the adult population of Jorhat, Assam and found that majority of the respondents had low level of knowledge regarding general nutrition.

Existing Knowledge Level of the Respondents Regarding Nutritional Deficiency Disorders

The existing knowledge of the respondents regarding nutritional deficiency disorders were assessed by administering a knowledge scale on different deficiency disorders such as PEM, vitamin A deficiency, anemia and IDD, their causes and symptoms. The existing knowledge level of the mothers regarding nutritional deficiency disorders is depicted in Figure 2.

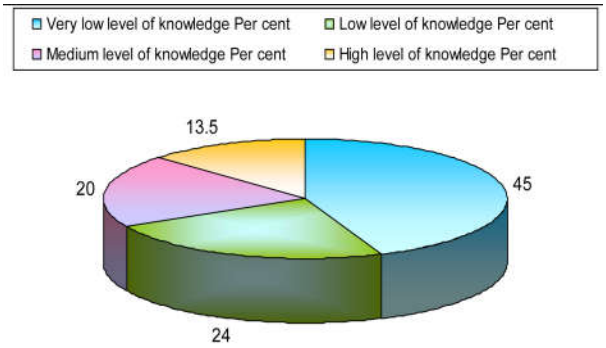

Fig. 2: Per cent distribution of respondents according to their existing knowledge on nutritional deficiency disorders Respondents (N=200)

Figure 2 indicates that 45 per cent of the mothers had very low level of knowledge followed by 24 per cent of the care-givers who had low level of knowledge while 20 per cent medium level and 13.5 per cent of them had high level of knowledge. Mohini (2005) in a study conducted at Dommasandra Primary Health Center in Bangalore reported that 40 per cent of the mothers had knowledge about the signs and symptoms of vitamin A deficiency. Momin (2008) reported that majority of the adult Garo women of West Garo Hills district; Meghalaya had low level of knowledge regarding sources of nutrients and its importance.

Overall Existing Knowledge Level of Respondents

Overall existing knowledge level of the respondents is depicted in Figure 3.

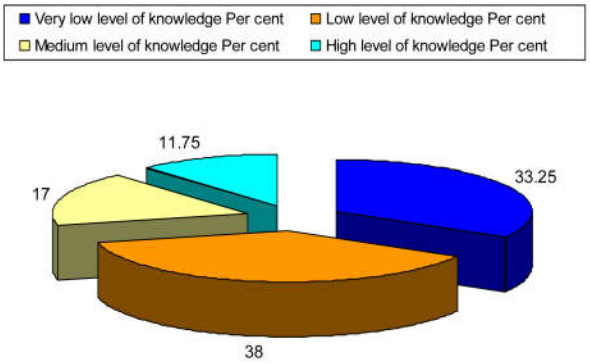

Fig. 3: Per cent distribution of respondents according to overall existing knowledge level Respondents (N=200)

Figure 3 indicates that 33.25 per cent of the mothers had very low level of knowledge, 38 had low level of knowledge followed by 17 had medium level of knowledge and 11.75 had high level of knowledge. The results indicate that majority (38 per cent) of the

care-givers had very low level of overall existing knowledge and very few per cent (11.75 per cent) had high level of knowledge. Therefore, the results of this study strengthen the need for proper nutrition education to improve their knowledge level regarding basic five food groups and nutritional deficiency disorders.

Mean Pre-Exposure (Existing) Knowledge Scores of the Respondents

In order to observe the impact of nutrition education on the respondents, knowledge scores on all aspects and overall knowledge of the respondents were subjected to mean score analysis prior to nutrition education exposure and the results are presented in Table 1.

The Table 1 shows the mean pre-exposure (existing) knowledge scores of the respondents on the given aspects.

It is evident from the Table 1 that the mean pre-exposure (existing) knowledge scores of the respondents on basic five food group was 5.51 and the mean pre-exposure (existing) knowledge scores of respondents regarding nutritional deficiency disorders was 2.84. The overall mean pre- exposure knowledge scores of the respondents was found to be 8.35.The analyzed data reveals that majority of the respondents had low level of existing knowledge and the mean pre-exposure (existing) knowledge scores of the respondents were not very high. So, the knowledge level of the respondents can be enriched by imparting nutrition education, because the main objective of nutrition education is to equip the care-givers with knowledge and skills in various aspects of proper nutritional care of the preschool age children so that this vulnerable age group shall not be deprived of the full potentiality to be a bright and adult in later life.

Impact of Nutrition Education in Terms of Gain in Knowledge by the Respondents

While assessing the existing nutritional knowledge of the mothers it was observed that in all the aspects both in basic five food groups and nutritional deficiency disorders, the knowledge level of the mothers was low.

Therefore, nutrition education was imparted to the mothers to improve their nutritional knowledge by considering these aspects and the impact of nutrition education among the mothers was assessed in terms of gain in knowledge by administering the same knowledge scale after 7 days of imparting nutrition education and the results are presented under the following heads:

- Mean post-exposure knowledge scores of the respondents
- The difference between mean pre-exposure knowledge and mean post-exposure knowledge scores of the respondents

Table 1: Mean pre-exposure (existing) knowledge scores of the respondents

Sl. No.	Aspects	Mean pre-exposure (existing) knowledge scores	Maximum possible scores
1.	Basic five food groups	5.51	10
2.	Nutritional deficiency disorders	2.84	10
3.	Overall knowledge	8.35	20

Table 2: Mean post-exposure knowledge scores of the respondents

Sl. No.	Aspects	Mean post-exposure knowledge scores	Maximum possible scores
1.	Basic five food groups	9.03	10
2.	Nutritional deficiency disorders	7.73	10
3.	Overall knowledge	16.76	20

Table 3: Difference between mean pre-exposure knowledge and mean post-exposure knowledge scores of the respondents

Sl. No.		Mean pre-exposure	Mean post-exposure	'z' value
1	Basic Five food groups	5.51	9.03	35.65*
2	Nutritional deficiency disorders	2.84	7.73	32.17*
3	Overall knowledge	8.35	16.76	65.35*

*- significant at 5 per cent level

Mean post-exposure knowledge scores of the respondents

The Table 2 shows the mean post-exposure knowledge scores of the respondents on the given aspects.

It is evident from the Table 2 that the mean post-exposure knowledge scores of the respondents on basic five food group was 9.03 and the mean existing knowledge scores of respondents regarding nutritional deficiency disorders was 7.73. The overall mean post-exposure knowledge scores of the respondents was found to be 16.76.

Difference between mean pre-exposure knowledge and mean post-exposure knowledge scores of the respondents.

The difference between mean pre-exposure knowledge scores and mean post-exposure knowledge scores has been termed as "gain in knowledge". The results are presented in Table 3.

The results revealed that the difference between mean pre-exposure knowledge scores and mean post-exposure knowledge scores were found to be significant in case of the two aspects.

There was an increase in knowledge scores of the respondents in all the given aspects which include basic five food groups and nutritional deficiency disorders, which indicated a significant gain in knowledge by the mothers at the post-exposure.

The findings are in accordance with (Prakash *et al.,* 2012) that the nutrition education improved the nutrition knowledge of parents and their children which in turn improved their food behavior and dietary diversity in urban Bangalore, India. Similar study was done by Kabahenda (2006) who reported that the nutrition education intervention was effective in improving caregivers' food selection practices and meal planning skills and improve children's nutritional status and growth in Western Uganda.

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Review Article

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Paleo Diet

K. Silambuselvi*, B. Jayabharathi**

Abstract

The Global increase in chronic and diet related metabolic diseases has focused interest in Paleolithic diet. The Paleo Diet allow us to tap into our genetic potential and start a healthy lifestyle. It includes whole, unprocessed foods that resemble what they look like in nature. Paleo diet has the potential to supply ample amounts of all important micronutrients, due to its focus on whole foods, food diversity and food quality, Various researches also shows that Paleo diet is the healthiest way to eat since it is a nutritional approach that works with our genetics to help us stay strong, lean and prevent us from wide spectrum of diseases.

Keywords: Paleo Diet; Genetics; Chronic Diseases; Unprocessed Foods; Micronutrients.

Introduction

Farming and Multiple technological advances created impact on human dietary pattern. Modern humans were genetically the same as our ancestors. Paleo diet follow a nutritional plan based on the eating habits of our ancestors in the Paleolithic period, between 2.5 million and 10,000 years ago. The Paleolithic diet is also called the paleo diet, caveman diet or stone-age diet.

Wide variability exists in the way the diet is interpreted. However, the diet typically includes vegetables, fruits, nuts, roots, meat, and organ meats while excluding foods such as diary products , grains, sugar, legumes, processed oils, salt, and alcohol or coffee [1].

Research in biology, biochemistry, Ophthalmology, Dermatology and many other disciplines indicate it is our modern diet, full of refined foods, trans fats and sugar, that is at the root of degenerative diseases such as obesity, cancer, diabetes, heart disease, Parkinson's, Alzheimer's, depression and infertility. – Robb Wolf.

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Essentials of Paleo Diet

A paleo diet is rich in all essential elements of a healthy diet. The aim of a paleo diet is to return to a way of eating that's more like what early humans ate. The belief is that the human body is better suited to that type of diet than to the modern diet that emerged with farming. They lived eating such foods and were free of diseases like diabetes, obesity, and heart disease. So the Paleo diet is promoted as a way of improving health [2].

The scientific literature generally uses the term "Paleo nutrition pattern", which has been variously described as:

- "Vegetables, fruits, nuts, roots, meat, and organ meats" [3];
- "vegetables (including root vegetables), fruit (including fruit oils, e.g., olive oil, coconut oil, and palm oil), nuts, fish, meat, and eggs, and it excluded dairy, grain-based foods, legumes, extra sugar, and nutritional products of industry (including refined fats and refined carbohydrates)" [4] and
- "avoids processed foods, and emphasizes eating vegetables, fruits, nuts and seeds, eggs, and lean meats".

According to Cordain's 2002 book, Paleo diet includes

- 55% of daily calories from seafood and lean meat, evenly divided
- 15% of daily calories from each of fruits, vegetables, and nuts and seeds

- No dairy, almost no grains (which Cordain described as "starvation food" for Paleolithic people), no added salt, no added sugar.

Building A Healthy Paleo Diet

Lean Proteins

Lean proteins support strong muscles, healthy bones and optimal immune function. Protein also makes you feel satisfied between meals.

Fruits and Vegetables

Fruits and vegetables are rich in antioxidants, vitamins, minerals and phytonutrients that have been shown to decrease the likelihood of developing a number of degenerative diseases including cancer, diabetes and neurological decline.

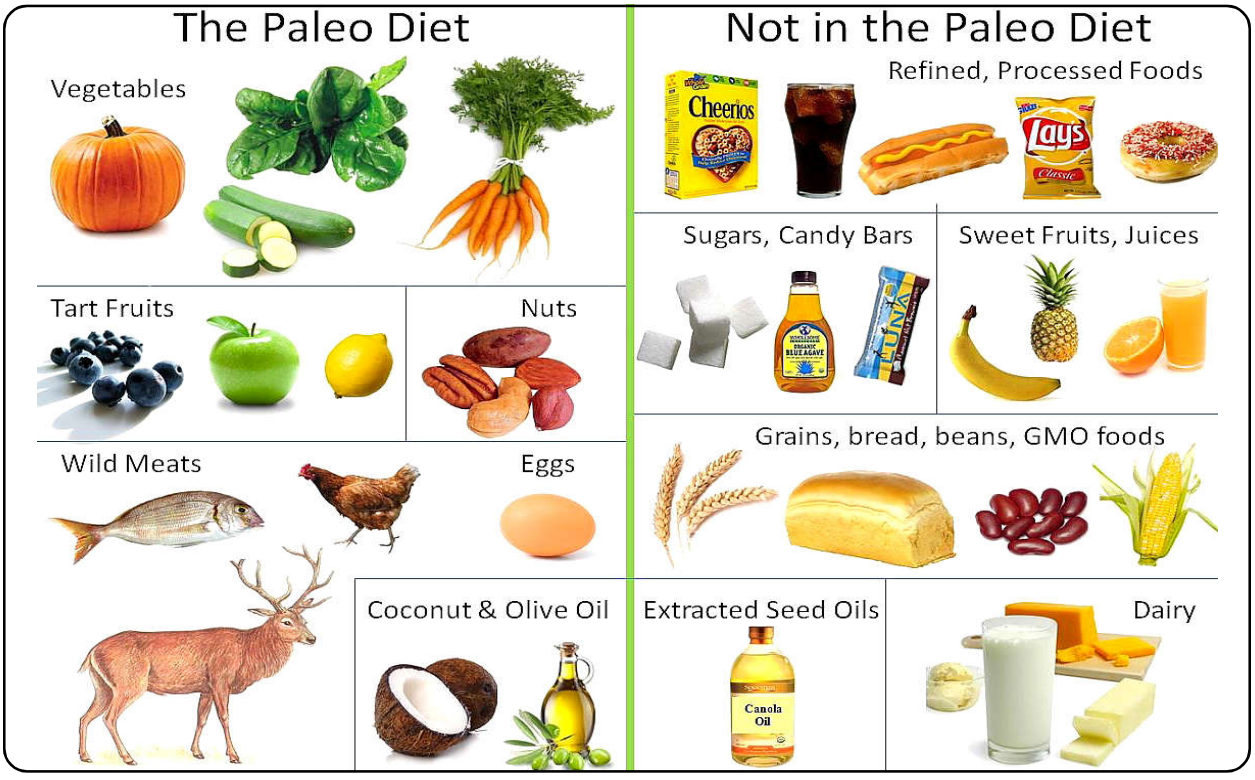
Healthy fats from nuts, seeds, avocados, olive oil, fish oil and grass-fed meat Scientific research and epidemiological studies show that diets rich in Monounsaturated and Omega-3 fats dramatically reduce the instances of obesity, cancer, diabetes, heart disease and cognitive decline. One of the greatest deviations away from our ancestral diet is the amounts and types of fat found in modern grain feed animals vs. the amounts and types of fats found in grass fed or wild meat, fowl and fish. Wild meat is remarkably lean, and has relatively low amounts of saturated fats, while supplying significant amounts of beneficial omega-3 fats such as EPA and DHA. Prof. Cordain and his team analyzed the complete fatty acid profile from several species of wild deer and elk. The message is that free range meat is far healthier than conventional meat [5].

Foods to be Taken

- Grass-produced meats
- Fish/seafood
- Fresh fruits and veggies
- Eggs
- Nuts and seeds
- Healthful oils (Olive, walnut, flaxseed, macadamia, avocado, coconut)

Foods to be Avoided

- Cereal grains
- Legumes (including peanuts)
- Dairy
- Refined sugar
- Potatoes
- Processed foods
- Salt
- Refined vegetable oils [6]



Health Benefits of a Paleo Diet

For most people the fact the Paleo diet delivers the best results is all they need. Improved blood lipids, weight loss, and reduced pain from autoimmunity is proof enough.

Does it Work for Diabetes?

Paleo diet have a low glycaemic load despite being composed mostly of carbohydrates. It improves plasma glucose and other markers of glycaemic control.

A randomised controlled trial of the Palaeolithic versus Mediterranean-like diet in 29 patients with ischemic heart disease and impaired glucose metabolism over 12 weeks was conducted by Lindeberg et al. Their study showed that both groups lost approximately the same amount of weight; however, the Palaeolithic group showed a significantly decreased waist circumference and improved glucose sensitivity [7]. Again this study was elaborated in 2009 by other researchers, comparing Palaeolithic and diabetic-like diet, Palaeolithic diet showed improved HbA1c, diastolic blood pressure, lipid profile, weight and waist circumference, and there was no statistically significant change in C-reactive protein [8].

Cardio Vascular Disease

According to the CDC, cardiovascular disease is the number one cause of death in the United States. Interestingly however, Paleolithic ancestors and contemporarily studied hunter-gatherers showed virtually no heart attack or stroke while eating ancestral diets. A study was conducted by Frassetto et al among nine non-obese, sedentary, healthy volunteers, comparing the Palaeolithic diet to their usual diet. Results showed significant reductions in blood pressure with improved arterial distensibility, insulin sensitivity and plasma lipids among Paleolithic diet volunteers, all unrelated to body weight [9].

Another longer term trial on the Palaeolithic diet was performed by Mellberg et al. They conducted a randomised controlled trial of 70 women who were obese and post-menopausal, and they compared the Palaeolithic diet to a reference diet based on the Nordic Nutrition over a two-year period .

The Palaeolithic group lost significantly more weight than the group on the reference diet at six months, although this was not sustained at the 24-month mark. The Palaeolithic diet group lost more body fat and lean tissue than the reference group. Both groups showed similar improvements in blood pressure, CRP and cholesterol [10].

Protects from Cancer

A 2014 study analysed the incidence of colorectal polyps versus the diet history given on a standardised dietary questionnaire and found that greater adherence to the Paleolithic diet pattern is associated with lower risk of sporadic colorectal adenomas. Fruits and vegetables have certainly been shown to be protective against cancer [11].

Reduces Weight and Creates Satiety

Since Paleo diet's focus on protein from lean meat and seafood it makes people feel full more quickly and so can help people eat less [12]. A pilot study was conducted in 2008 in which 14 healthy volunteers were placed on the Palaeolithic diet over the course of three weeks. Across all participants, there was a significant mean weight loss of 2.3 kg over the three weeks and a mean decrease in waist circumference by 0.5 cm. Systolic blood pressure improved slightly and there was also a stark rise in C-reactive protein [13].

A 2013 study also tested the satiety of the Palaeolithic diet, by comparing with the diabetic diet, in a randomised crossover trial of 13 patients with type 2 diabetes. The Palaeolithic diet resulted in greater satiety quotients for energy, energy density and glycaemic load per meal than the diabetic diet. They concluded a Paleolithic diet is more satiating per calorie than a diabetes diet in patients with type 2 diabetes and it was seen as instrumental in weight loss [14].

Conclusion

Due to civilization modern population develops many health problems and chronic diseases. Researches prove that the aspects of the Paleo diet advise eating fewer processed foods and less sugar and salt.The evidence related to Paleolithic diets is best interpreted as supporting the idea that diets based largely on plant foods promote health and longevity, at least under conditions of food abundance and physical activity [15]. It is judicious for Modern humans to remember their evolutionary heritage and increase their intake of vegetables and fruits and decrease their intake of animal fats and domesticated grains.

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Review Article

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Psychological Implication of Polycystic Ovary Syndrome

Mohini Paliwal*, Vandana Bharti, Kirti Tiwari*****

Abstract

Polycystic ovary syndrome (PCOS), a hormone imbalance that causes infertility, obesity and excessive facial hair in women, can also lead to severe mental health issues including anxiety, depression and eating disorders. Common physical manifestations of PCOS: acne, obesity, hirsutism, and anovulation can have adverse effects on female's self-image and mood. Dissatisfaction with body image is one of the major causes for psychological disorders even in a healthy population; most women affected by PCOS are overweight, and having a high BMI exposes them to several appearance-related challenges. Therapy should focus on both the short and long-term reproductive, metabolic and psychological features. Small achievable goals of 5% loss of body weight result in significant clinical improvement even if women remain clinically in the unhealthy overweight or obese range. The present study showed that clinical signs of PCOS were most closely associated with psychological distress which has important implications in the diagnosis and treatment of disorder.

Keywords: Anxiety; Depression; Hirsutism; Obesity; Polycystic Ovary Syndrome.

Introduction

Nowadays, quality of life is widely considered an important parameter for evaluating the quality and outcome of health care, particularly for patients suffering from chronic disorders: polycystic ovary syndrome is one of these. PCOS is a heterogeneous endocrine and metabolic disorders, characterized by chronic anovulation/ oligomenorrhea, hyperandrogenism, and insulin resistance. Prevalence of PCOS among women at reproductive age was reported to be 5-10% [1]. Clinical symptoms of PCOS could compromise women's quality of life and have a strong negative effect on mood, psychological well-being and sexual satisfaction. Physically visible PCOS symptoms are more likely to provoke distress in younger women than older women [2]. The "American college of obstetricians and gynecologists" suggests that, in view of the high prevalence rate of depression and persistence of new cases in PCOS population, an initial evaluation of all PCOS women should also include assessment of mental health disorders. The Primary care evaluation of Mental Disorders Patients Health Questionnaire [3] is suitable to evaluate eating disorders [4]. Furthermore, its interpretation and scoring are very simple. Promisingly, lifestyle intervention comprising dietary, exercise and physco-behavioral therapy improve clinical symptoms of PCOS that affected women's quality of life.

Etiology

Insulin resistance and hyperandrogenism: the exact pathophysiology of PCOS is complex and remains largely unclear. Schema of aetiology and psychosocial features of PCOS (Figure 1). Genetic and environmental contributors to hormonal disturbances combine with other factors, including obesity, ovarian dysfunction and hypothalamic pituitary abnormalities to contribute to the aetiology of PCOS. [5,6]. Hyperandrogenism is a well established contributor to PCOS aetiology, detected in around 60% to 80% of cases. Insulin resistance is a patho-physiological contributor in around 50% to 80% of women with PCOS [7], especially in those with more severe PCOS diagnosed on National Institute of

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Health (NIH) criteria and in women who are overweight.

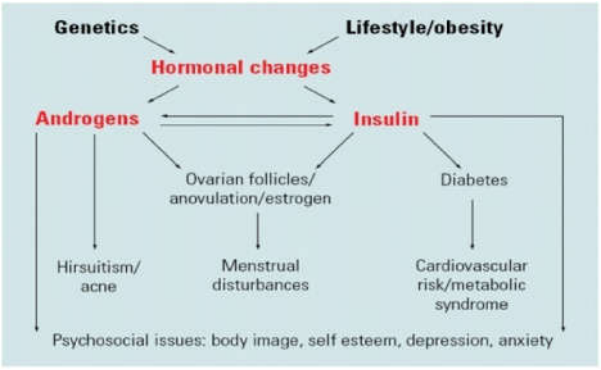

Fig. 1: Schema of etiology and clinical features including reproductive, metabolic and psychosocial features of polycystic ovary syndrome

Diagnosis of PCOS

The different diagnostic criteria for polycystic ovary syndrome with the four key diagnostic features, (Oligomenorrhea /amenorrhea, clinical or biochemical hyperandrogenism and PCO on ultrasound) there are many potenotypes (Table 1).

PCOS Symptoms and Psychological Correlation

Obesity and Body Image

Some studies showed that PCOS women have lower quality of life and overweight was the largest contributor to poor quality of life [8]. In fact, health related quality of life questionnaire in women with PCOS have shown that excess weight and difficulties with losing weight are the foremost concerns [9].

Table 1: The different diagnostic criteria for polycystic ovary syndrome

PCOS- Diagnostic Criteria		
NIH (1900)	**Rotterdam (2003)**	**AES (2006)**
•Menstrual Irregularity •Hyperandrogenism •Exclusion if other etiologies	•2 out of 3 required 1.Menstual Irregularity 2.Hyperandrogenism 3.USG-Polycystic ovary •Exclusion if other etiologies	•Menstrual Irregularity +/- USG Polycystic ovary •Hyperandrogenism •Exclusion if other etiologies

Women with PCOS report that they are not happy with the way they look or the way that clothes fit them and consequently do not feel their body is sexually appealing [10]: these feelings are negatively associated with self esteem, body satisfaction, and fear of negative appearance evaluation [11].

Hirsutism

Women with PCOS recognize excessive hair growth especially on face as the second most severe symptom negatively affecting on their life satisfaction [12]. The presence of facial hair is one of the most essential and visible difference between men and women: hair on a female face reflects a symbolic transgression between the two genders [13]. As shown in a quality study, hirsute women feel "slaves of their own body" and describe this condition as a "prison" [14]. Moreover, looking in the mirror very often could represent an obsessive-compulsive behavior [15].

Infertility and Sexual Life

Characteristics symptoms of PCOS occur during a life period in which relationships, marriage, and having child play an important role: for this reason, changes femininity are likely to mean an increased risk of psychological distress [16]. Some patients are infertile and are subjected to social pressure due to the importance given to having children by the society. Having a partner who supports the hope of having a child was found to be a protective factor and improves the emotional well being of PCOS patients [17]. Moreover, according to a study, even adolescent girls with PCOS are 3.4 times more likely than healthy girls to be "worried about their ability to become pregnant in the future" compared to the controls; however this fear was not associated with odds of having sexual intercourse [18,19]. An alternative psychological explanation is that some women with PCOS felt that their partner were not attracted by them [16].

PCOS and Mental Disorder

Mood Disorders

Several studies have been investigating the association between PCOS and depression. The result is that PCOS women reported more depressive symptoms compared with the control group [16,20] and scored above average on questionnaire assessing

depression [21, 22]. The prevalence of depression in women with PCOS is high, ranging from 28 to 64% (23). Studies found that 14% of women suffering from PCOS reported suicidal ideation. This percentage is high as what has been reported from other chronic medical conditions and much higher than in the general population [24]. Two thirds of women with PCOS show weight problems, but it is not properly correlated only to PCOS: in fact, high BMI might increase depression in the normal population as well [25, 26]. Some studies found depressed women with PCOS to have a higher evidence of insulin resistance and impaired fasting glucose than PCOS women without depression [21]. In view of all these data and because the peak incidence of depression is during the reproductive years, gynecologists have to be able to identify and treat women with PCOS who have depression.

Anxiety

Anxiety symptoms could be identified in one third of PCOS patients, especially social phobia [24, 26, 27]. It has been associated mainly with hirsutism, ache, obesity and infertility. The prevalence of anxiety in women with PCOS ranges from 34 to 57% [23]. Fears reported by hirsute women are mainly categorized as "social phobia" or anxiety evoking situations, such as meeting strangers, attending parties, shopping and mixing at work [28]. Some authors have suggested that adolescents with PCOS are at higher risk for anxiety symptoms related to the clinical signs of hyperandrogenism. In a study of hirsute 13-18 years old girls, anxiety was diagnosed in 26% compared with 10% in the control girls [29]. Further more successful treatment of hirsutism leads to a reduction of time spent on hair removal with a consequent improvement in anxiety score [30]. Most women with PCOS reported sleep disorders: a partial explanation for this finding might be that sleep apnea is common in obese women with PCOS, androgen excess and subnormal estrogen levels and visceral adiposity may be involved in sleep disturbances [31].

Eating Disorders

Association between PCOS and eating disorders has been suggested, mainly correlated to the body image dissatisfaction compared to the general population, eating disorder seem to be more prevalent in PCOS population: 12.6% bulimia and 1.6% anorexia. Moreover an epidemiological cohort study of eating disorders among hirsute women showed a high prevalence of untreated eating disorders especially EDNOS (eating disorders not otherwise specified) and bulimia nervosa; hirsute women with an eating disorder had high levels of co morbid depression and anxiety [32].

Conclusions

PCOS is a common complex condition inwomen associated withpsychological, reproductive and metabolic features. It is chronic disease with manifestations across the lifespan and represents a major health and economic burden. Both hyperandrogenism and insulin resistance contribute to pathophysiology of PCOS. Clinical symptoms of PCOS could compromise women's quality of life and have a strong negative effect on mood, psychological well being and sexual satisfaction. Insulin resistance occurs in the majority of women with PCOS, especially those who are overweight and these women have a high risk of metabolic syndrome, prediabetes and DM Type 2. Management should focus on support, education, addressing psychological factors and strongly emphasising healthy lifestyle with targeted medical therapy as required. Treatment for the large majority is lifestyle focused and an aggressive lifestyle based multidisciplinary approach is optimal in most cases to manage the features of PCOS and prevent long term complications. Small achievable goals of 5% loss of body weight results in significant clinical improvement even if women remain clinically in the unhealthy overweight or obese range. Consideration should be given to screening high risk family members for metabolic abnormalities also. Overall further research is needed in this complex condition. In the interim comprehensive evidence based guidelines are needed to guide consumers and clinicians in optimal PCOS management.

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13	Indian Journal of Genetics and Molecular Research	2	6500	6000	650	600
14	Indian Journal of Law and Human Behavior	2	5500	5000	550	500
15	Indian Journal of Library and Information Science	3	9000	8500	900	850
16	Indian Journal of Maternal-Fetal & Neonatal Medicine	2	9000	8500	900	850
17	Indian Journal of Medical & Health Sciences	2	6500	6000	650	600
18	Indian Journal of Obstetrics and Gynecology	3	9000	6500	700	650
19	Indian Journal of Pathology: Research and Practice	3	11500	11000	1150	1100
20	Indian Journal of Plant and Soil	2	5500	5000	550	500
21	Indian Journal of Preventive Medicine	2	6500	6000	650	600
22	Indian Journal of Research in Anthropology	2	12000	11500	1200	1150
23	International Journal of Food, Nutrition & Dietetics	3	5000	4500	500	450
24	International Journal of History	2	6500	6000	650	600
25	International Journal of Neurology and Neurosurgery	2	10000	9500	1000	950
26	International Journal of Political Science	2	5500	5000	550	500
27	International Journal of Practical Nursing	3	5000	4500	500	450
28	International Physiology	2	7000	6500	700	650
29	Journal of Animal Feed Science and Technology	2	4100	3600	410	360
30	Journal of Cardiovascular Medicine and Surgery	2	10000	8600	910	860
31	Journal of Forensic Chemistry and Toxicology	2	9000	8500	900	850
32	Journal of Microbiology and Related Research	2	8000	7500	800	750
33	Journal of Orthopaedic Education	2	5000	4500	500	450
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38	New Indian Journal of Surgery	3	7500	6600	710	660
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46	Indian Journal of Trauma & Emergency Pediatrics	3	9000	8500	900	850
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48	Journal of Community and Public Health Nurisng	2	5000	4500	500	450
49	Journal of Geriatric Nursing	2	5000	4500	500	450
50	Journal of Medical Images and Case Reports	2	5000	4500	500	450
51	Journal of Nurse Midwifery and Maternal Health	3	5000	4500	500	450
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Indian Journal of Genetics and Molecular Research	2	6500	650
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Indian Journal of Library and Information Science	3	9000	900
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