An observational study of symptoms and weight loss of obese women with polycystic ovarian syndrome

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Abstract

Background & Objectives: Polycystic Ovarian Syndrome (PCOS) occurs among females of reproductive age and prevalence ranges from 3.7 to 22 per cent in Indian women. As weight management is recommended as one of the first line of treatment for PCOS, the present study was conducted to assess the impact of weight loss and improvement of selected symptoms of PCOS clients enrolled in Truweight program.

Materials & Methods: This was a six months observational study among known PCOS females enrolled in the Truweight program between the ages of 17 to 40 years, BMI > 30kg/m2 were selected using purposive sampling technique. Initial and final data were collected in terms of weight, BMI, nutrient intakes, and selected symptoms. Initial and final readings were recorded and the data was analysed using suitable statistical techniques.

Results: There was a significant reduction in BMI (35.28± 5.79 to 30.65 ±5.56) after following Truweight program. The per cent weight loss was between 8 to 20 percent of their initial body weight. Major PCOS symptoms like Irregular cycles (84 per cent), Facial hair (54 per cent) and Acne (32 per cent) have shown improvement. The mean macronutrient intakes such as carbohydrate (154.38g), protein (46.22g) and fat (25g) were positively correlated with weight loss.

Conclusion: The present study concludes that diet management is key to significant reduction in BMI and help improving the PCOS condition and the symptoms associated.

Keywords: polycystic ovarian syndrome, weight loss, body mass index, truweight, symptoms

1. Introduction

Polycystic ovarian syndrome (PCOS) is a common endocrine disorder seen among women who are of reproductive age and is comprising of all races and ethnicities [1]. Also, it is referred to as the 'Syndrome O' i.e. Over nourishment, Overproduction of insulin, Ovarian confusion and Ovulatory disruption and hence, PCOD is called as Polycystic Ovarian Syndrome (PCOS). Polycystic Ovarian Syndrome (PCOS) occurs among females of reproductive age and the prevalence ranges from 3.7 to 22 per cent in Indian women [2]. Both genetic and environmental factors contribute to the syndrome [3]. The etiology of PCOS is not completely understood and there is no known cause, although a genetic component and diet/lifestyle factors, such as insulin resistance and obesity have been identified [4]. PCOS females are at a great risk for a group of metabolic disorders such as insulin resistance, glucose intolerance impairment, diabetes, hypertension, lipid disorders, cardiovascular disease, and increased risk of endometrial, uterine, and breast cancers. PCOS is a heterogeneous disorder in which both increased ovarian androgens and possibly adrenal and some degree of metabolic disorders exist [5].Common symptoms of PCOS include irregular menstrual cycles, polycystic ovaries, and hirsutism, as well as an increased risk for a multitude of conditions, including insulin resistance, dyslipidemia and infertility [6]. Weight management is recommended as one of the first line of treatments for PCOS [7] to improve hormonal disturbances and to prevent future reproductive and metabolic complications. In the light of the above observations, the present study was taken up with the following objectives:

- To assess the demographic characteristics of the PCOS clients
- To assess the prevalence of selected symptoms among the clients
- To ascertain the BMI of the PCOS clients
- To assess the impact of weight loss on improvement of selected symptoms of PCOS clients
- To determine the correlation between the macronutrients (carbohydrates, protein, fat and fibre) intake with weight loss among PCOS clients enrolled in Truweight program.

2. Methodology

2.1 Research design

The present study was an observational study undertaken for a period of six months among PCOD clients enrolled in the Truweight program. Truweight is a research and nutrition based healthcare company that helps people to deal with obesity and obesity related disorders. The enrolled clients will be provided with periodic diet counseling, a kit of foods containing functional ingredients and Truweight mobile application was used to track the food, water intake,

exercise, sleep pattern on a regular basis.

2.2. Truweight Health Program
Truweight health program comprises of three principal functionaries includes, customized meal plans and Superfoods, Personal Nutritionist and Doctors; tech based scientific analysis and constant mentoring.

2.3 Selection of clients
The location for the present study was Truweight Wellness Center. Based on the following inclusion and exclusion criteria, the data was collected from the clients.

Inclusion Criteria
- Age between 17 to 40 yrs
- BMI between 25 to 40 kg/m^2.
- Willing to follow the Truweight diet program, logging the foods, lab reports and updating weight in the Truweight mobile app as instructed.

Exclusion Criteria
- Age < 16 years and > 41 years
- BMI < 24.9 kg/m^2 and > 40.1 kg/m^2.
- Chronic ailments
- People who did not volunteer to participate in the study and not willing to use mobile app

2.4. Conduct of the Study
The clients of the study were enrolled online; under the Truweight health program. PCOS obese clients enrolled for the weight loss formed the study sample. After enrolment, they were given consultation through phone weekly. Food kits from Truweight were given monthly once and nutritionist connects with clients over the phone every week, guides on diet, physical activities and to monitor the progress of weight loss. The Ayurveda in-house physicians used to check for sugar updates once a month. Clients who were on medication for PCOS were asked to continue the same.

2.5 Collection of Data
2.5. A. Assessment of the demographic profile of the clients
Information regarding the demographic profile characteristics such as age, educational status, occupation, food habits were elicited using general questionnaire designed which was pre-tested and updated in the mobile app.

2.5. B. Assessment of the Nutritional health Status of the clients
The nutritional status of the clients was assessed from anthropometric measurements, clinical symptoms and dietary assessment.

2.5.B.i. Anthropometric measurements
Standardized techniques were used for measuring the height and weight of the clients. Heights of the clients were measured using stature meter and weight using digital weighing balance. The height and weight of all clients were recorded following the methods of Jellifee (1966) [8].

2.5. B.i.a. Height
When joined for the program, the clients were asked to check and update the height after checking in the stature meter. It was considered as Height.

2.5.B.i.b. Weight
When joined for the program, the clients were asked to check and update the weight in early morning empty stomach wearing light clothes after checking in the digital weighing scale. It was considered as Initial Weight. Later every week the clients were asked to check the weight in the similar way and update in the mobile app.

2.5.B.i.c. Body Mass Index (BMI)
The body Mass Index was calculated using the formula: BMI= weight in kg / height in m^2. Based on change in the weight, BMI was also changing. Initial and Final BMI and weight (kg) was considered for the study.

2.5.B. ii. Clinical Symptoms
There is a no. of clinical symptoms present in PCOS clients, ranging from central obesity, abnormal facial hair growth, acne, irregular cycles, and androgenic alopecia and so on. In the present study, we have collected data on facial hair growth, acne and irregular cycles. Using a checklist the presence or absence of facial hair growth was collected.

2.5.B. ii. a. Facial Hair Growth
Excessive facial hair growth is a common disorder resulting from androgen activity specified in women. The cause of facial hair growth in most women is PCOS.

2.5.B. ii. b. Acne
It's another feature of increased androgenic activity. Acne is one of the cutaneous manifestations of PCOS. Most women with PCOS exhibit facial acne lesions and up to 50 per cent women have involvement of the neck, chest, and upper back as well.

2.5.B. ii. c. Irregular cycles
Anovulation, the pathogenic feature of PCOS and /or androgen excess results in irregular menstrual cycles. Menstrual cycles deviated from normal length ≤35 days or >35 days were considered to be irregular cycles [9].

2.5. B. iii. Dietary Assessment
Assessment of the dietary pattern of the clients were carried out on the basis of the diet logs they update in the mobile app. Mean nutrient intake of the clients were obtained from the diet logs. In the mobile app, when a food is logged, get synced with the food database. The nutritional information is already available in the food database. Thus mean nutrient intake was collected. Major nutrients like carbohydrates, fats, proteins and fiber were calculated by using the standard formula.

2.6. Statistical Analysis of the data
For the present study, the data analysis was carried out using SPSS 2.0 for Windows. The weight and height of the clients were converted into respective BMI and analyzed for the study. The data was analysed by calculating the mean, standard deviation. Paired "t" test was used to test the significance before and after the program. Pearson Correlation was used to analyze the association between HbA_1c and different parameters. $p > 0.01$ was set for significance.

3. Results & Discussions

An observational study was carried out among the PCOS overweight and obese clients enrolled in the Truweight program for six months. The results are presented here.

3.1 Demographic Details
3.1. A. Age wise distribution of the clients

The mean age of the clients in the study was 29.62 ±6.284 years. Fig.1 shows age wise distribution of PCOS clients selected for the study.
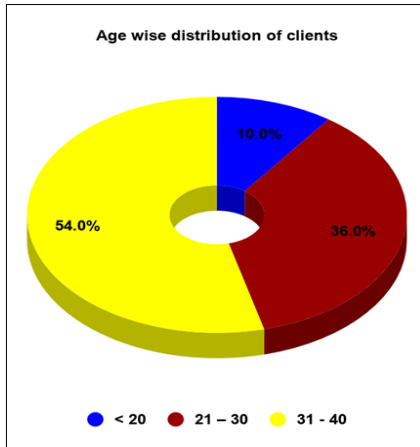

Fig 1: Age wise distribution of clients (N=50)

The clients selected were in the range of 20 to 40 years. The mean age of the selected PCOS clients were 29.62 ± 6.28 years. In the present study, around 54 per cent of the clients were in the age group of 31 to 40 years, 36 per cent were in the age group of 21 to 30 years, 10 per cent were in the age group of <20 years. An earlier study of 70 women between 18 to 45 years old in Mumbai, India reported mean age to be 27.65 ± 7.60 years [10].

3.1.B. Distribution of the clients based on Food Habits

Food habits and culture are interrelated, i.e., beliefs, values, and social norms have a role in forming nutritional habits [11]. In this study, clients were distributed based on food habits in the following ways - vegetarian, non-vegetarian and eggetarian. Fig. 2. shows the Distribution of the clients based on Food Habits
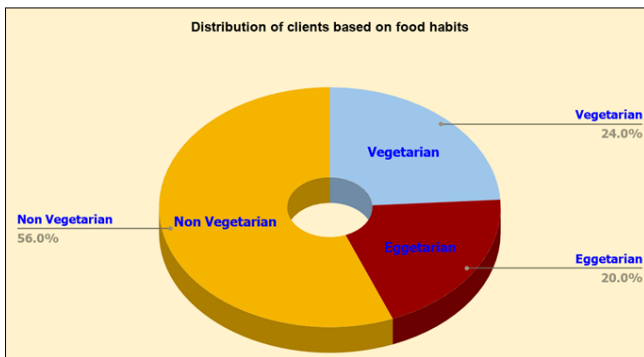

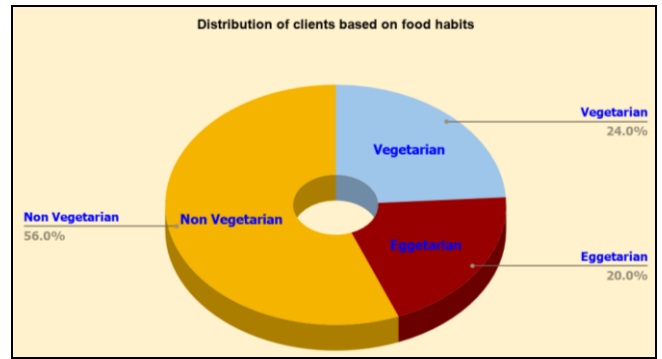**Fig 2:** Distribution of the clients based on Food Habits

Fig 3

As per Fig. 2, around 56 per cent of the clients were non vegetarian, 24 per cent vegetarian and 20 per cent eggetarian respectively. This is similar to the NFHS 2006 [12] reports which showed 64 per cent of the study population were non vegetarians.

3.1.C. Distribution of clients based on occupation

In the current study, clients were distributed based on the occupation. Fig. 3 shows occupation wise distribution of PCOS clients selected for the study.
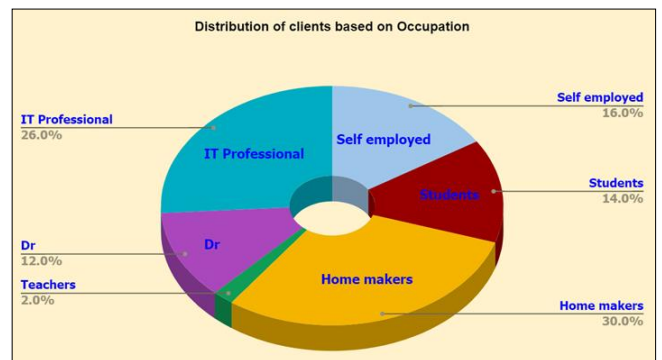

Fig 3: Occupation wise distributions of PCOS clients selected for the study

The clients were distributed in different categories based on occupation. In the present study, it was found that 30 per cent of the Home makers were suffering from PCOS, followed by 26 per cent IT professional, 16 per cent Self-employed, 14 per cent students, 12 per cent Doctors and 2 per cent were employed as Teachers. An earlier study carried out in Mumbai reported that maximum percentage of sufferers is seen among the students (47 per cent) [13] whereas in the current study majority of the clients were Homemakers.

3.B. Assessment of the Nutritional health Status of the clients

Nutritional assessment provides some information about the overall nutritional health status of the clients [14]. Using anthropometric measurements such as Body Mass Index, clinical assessment like presence of symptoms and dietary assessment in which mean intake of major nutrients such as Carbohydrate, protein, fat, fiber were taken into account.

3. B.1. Body Mass Index of the PCOS clients.

Body Mass Index (BMI) is calculated as weight in kilograms divided by the square of the height in meters (kg/m^2). World Health Organization [15] classified BMI into

four groups according to the Asian-Pacific cutoff points based 10 and is categorized into four groups according to the Asian-Pacific cutoff points underweight (<18.5 kg/m2), normal weight (18.5–22.9 kg/m2), overweight (23–24.9 kg/m2), and obese (≥25 kg/m2). Table 1. shows the BMI classification of the PCOS clients.

**Table 1:** Body Mass Index classification of the PCOS clients

BMI	Category	Per Cent
23–24.9	Overweight	NA
≥25 kg/m^2	Obese	100
Total		100

As per Table1, all clients enrolled for the study were having BMI > 25 kg/m^2 stating that they belong obese category. This could be due to the obese PCOS clients selected for the study.

3. B.2. Presence of Symptoms before joining Truweight
For the study, the presence of symptoms such as facial hair, Acne and irregular cycles were assessed using a checklist before starting the Truweight program.
Fig.4 shows the Presence of Symptoms among of PCOS clients.
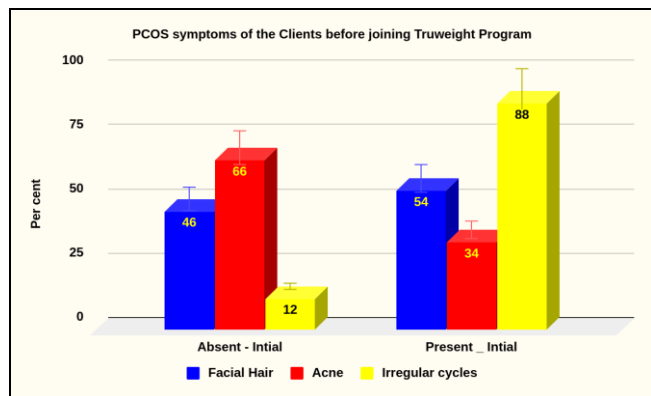
Fig 4: Presence of Symptoms among of PCOS clients

When joined the Truweight program, around 54 per cent of the clients were having facial hair growth and only 46 per cent were not having any facial hair growth. Around 34 per cent of the clients when joined Truweight program were having symptoms of Acne. A meta-analysis done in Iran [16] reported that prevalence of acne among the studied Iranian women were 26 per cent whereas in the present study, the presence of acne was higher Regular menstrual cycles are considered an indicator of a woman's reproductive health. Initially, 88 per cent of the PCOS clients had menstrual irregularity, which is the most common manifestation of PCOS. Menstrual abnormality was the most commonly noted symptoms in the study population and was seen in 95.7% of the females [9]. This is in line with the present study.

3.B.3. Mean Nutrient intake
Mean nutrient intake of the clients were obtained from the diet logs. Table 2. shows the Mean nutrient intake of the PCOS clients.

Table 2: Mean nutrient intake of the PCOS clients

	CHO (g)	Protein (g)	Fat (g)	Fibre (g)
Mean ± SD	154.38 ± 27.97	46.22 ± 17.07	25 ± 4.15	34.13 ± 5.15
RDA	200*	55#	25#	30#
% RDA met	77.5	84	100	113.76

*USDA [17] # RDA 2010 [18]

As per Table 2, it is found that the mean nutrient intakes of carbohydrates, protein, fat and fiber were 154.38g, 46.22g, 25g and34.13g respectively. The per cent RDA met were 77.5, 84, 100 and 113.76 per cent for carbohydrates, protein, fat and fiber respectively

3. C. Effect of Truweight Program on Weight loss and BMI, PCOS Symptoms
3. C.1. Weight loss among PCOS clients
Earlier study proven that weight loss through dietary restriction and increased physical activity are key management strategies for overweight and obese women with PCOS. In the current study the average weight loss percent among the clients were between 8 per cent to 20 per cent in 6 months duration. In the study, the clients were following the Truweight Program. Table 3 shows the changes in the weight ie. weight loss before and after Truweight Program.

Table 3: Weight loss before and after Truweight

	Before	After	Weight loss (Kg)
Weight (Kg)	93.0 ± 18.6	80.8 ± 17.6	12.2 ± 2.9

As per the Table 3, the mean initial weight of the PCOS clients were 93.0 ± 18.6 kg and after the program, the final weight were 80.8 ± 17.6 kg. The Total weight loss for the selected clients were 12.2 ± 2.9 kg in the study period.

3. C.2. Body Mass Index of PCOS clients
When there is weight loss, it will affect the Body Mass Index of the clients. Table 4. shows the BMI classification of the PCOS clients after the Truweight program

Table 4: BMI classifications of the PCOS clients after the Truweight program

Body Mass Index	Category	Per Cent
23–24.9	Overweight	6
≥25 kg/m^2	Obese	94
Total		100.

As per Table 4, 94 per cent of the were having BMI > 25 kg/m^2 which is obese category and 6 per cent of the clients BMI reduced to <24.9 kg/m^2 in the Overweight category,

3. C.3. Presence of PCOS symptoms after Truweight
After following Truweight program for six months, the presence of symptoms such as facial hair, Acne and irregular cycles were assessed using the checklist.
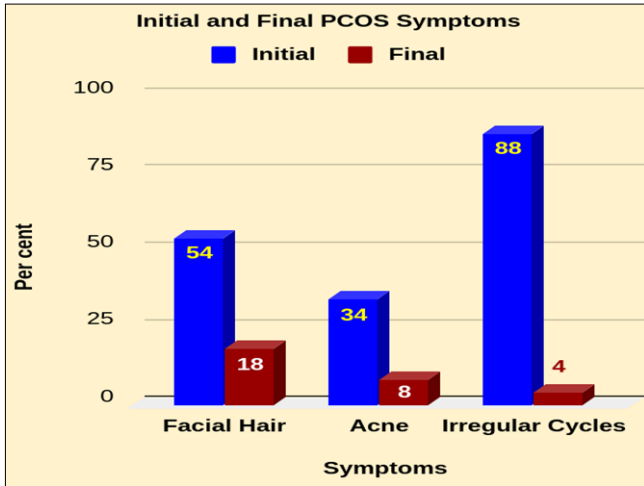
Fig 5: Changes in the PCOS symptoms before and after Truweight

As per Fig. 4, it is interpreted that, when enrolled 54 per cent of the clients were suffering from facial hair. After six months of following the Truweight program, it reduced to 18 percent. Around 34 per cent of the clients when joined Truweight were having symptoms of acne. After Following the Truweight program, the Acne symptoms reduced to 8 per cent clients. Irregular menstrual cycles were present among 88 percent initially reduced to 4 per cent after the program. There was an improvement in the studied symptoms such as facial hair, acne and irregular menstrual cycles among 66.67 per cent, 77 per cent and 95.45 per cent respectively of the PCOS clients following the Truweight program. Earlier studies also suggested a reduction of 5% weight can restore regular menstruation and improve response to ovulation [19].

3.D. Association between Nutrient intakes, Weight loss, BMI
3.D.1. Correlation among Macronutrient intakes of clients
A correlation analysis between macronutrients intake and weight loss in PCOS clients was carried out. Table 5 shows the Correlation between Macronutrient (carbs, protein, fat and fiber) intake in PCOS Clients.

Table 5: Correlation between Macronutrient intakes in PCOS Clients

Correlation	CHO	Protein	Fat	Fibre
CHO	1.0000			
Protein	0.7540**	1.0000		
Fat	0.7001**	0.8063**	1.0000	
Fibre	0.8559**	0.6405**	0.4886**	1.0000

**Significant at 0.01 level

Above table depicts about the correlation between Macronutrients intake of the PCOS clients. The analysis showed that macronutrient intake was positively correlated with each other at 1% level of significance.
Studies recommend that specific dietary approaches in PCOS include high protein, low carbohydrate, and low glycemic index/glycemic load diets. A number of small studies assessing specific dietary approaches in PCOS show similar results for diets moderately increased in dietary protein or carbohydrates [20]. Reduced body weight is associated with a decrease in metabolically active visceral fat, which in turn leads to decreased insulin resistance and

an optimised lipid profile [21]. The importance of focusing lifestyle interventions to promote weight management through physical activity and dietary advice on quality and quantity of fat, as well as carbohydrate modification [22].

3.D.2. Correlation between Weight loss % with Macro Nutrients of Clients
Earlier studies showed that weight loss has a significant role in the management of PCOS. Table 6 shows association between Weight loss % and the Macronutrients intake of the PCOS Clients

Table 6: Correlation between Weight loss % and Macronutrients intake of the clients

Correlation	CHO	Protein	Fat	Fiber
Weight loss %	0.7540**	0.7001**	0.8559**	0.0676NS

**Significant at 0.01 level, NS Not significant

Above table depicts about the correlation between Macronutrients intake like carbohydrates, protein, fat and fiber and weight loss among PCOS Clients. The analysis showed that intake of macronutrients such as carbohydrates, protein and fat were positively correlated with total weight loss among clients at 1% level of significance. Fiber intake was positively correlated with total weight loss but not significant. This shows that all the macronutrients intakes were maintained in spite of weight loss among subjects. A balanced nutrient intake plays an important role. No need to exclude any macronutrients for losing weight.

3.D.3 Effect of Truweight Program in BMI of PCOS clients
The initial BMI of the PCOS Clients were 35.28 ± 5.79 kg/m^2 and final weight were 30.65 kg ± 5.56 kg/m^2. Table 7 shows the Difference in BMI before and after Truweight Program.

Table 7: Difference in BMI before and after Truweight Program

BMI	No. of Clients	Mean	SD	Paired t value	p value
Initial	50	35.28	5.79	25.0136	< 0.001
Current	50	30.65	5.56		

Table 7 shows the Difference in BMI among the PCOS clients before and after Truweight Program. There was a significant reduction in the weight of the Clients after following the program. The reduction in weight loss affected BMI of the PCOS Clients. Earlier studies proved that weight management losing 5 to 10% of initial body weight through lifestyle intervention which includes combination of diet, exercise and behavioural modification as first line treatment [23]. This is in line with the present study, where Truweight program also offers Life style modification along with diet.

3.E. Impact of No. of days of programme on Total Weight loss among clients
A linear regression analysis was carried out to assess the association between no. of days of following the truweight program with total weight loss. Table 7 shows the Impact of No. of days of programme on Total Weight loss among clients.

Table 7: Impact of No. of days of programme on Total Weight loss among clients

Variable	Coefficient	Standard error	t value	Model F value	R^2
Intercept	9.4061	1.0730	8.7658**	8.0367**	0.1434
No. of days	0.0150	0.0052	2.8349**		

** Significant at 0.01 level

Table 7 depicts that total weight loss was significantly dependent on no. of days of following the program by the PCOS clients. That is longer the duration of training higher will be the weight loss among subjects.

Summary and conclusion

The present prospective observational study was undertaken for a period of six months among 50 PCOS clients in the age group of 17 to 40 yrs based on Rotterdam Criteria enrolled in the Truweight program. Majority of the women in the study were in the age of 30 to 40 years; with the mean age of the selected PCOS Clients were 29.62 ± 6.28 years. had a BMI above 30. PCOS management should focus on support and education, and needs to strongly emphasize healthy lifestyle, with targeted medical therapy as required [9]. First line therapy for PCOS involves lifestyle modifications, including nutritional counseling and exercise to help stave off the threat of diabetes by promoting weight loss and improved glucose metabolism, both of which contribute to stabilization of some of the more distressing syndromes related to the condition. The present study concludes that Truweight Dietary Management approach contributes to significant reduction in BMI and help improving the PCOS condition and the symptoms associated.

Acknowledgement

Conflict of Interest
Nil

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