

## Effect of Diet and Nutrient Intake on Women Who Have Problems of Fertility

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### ABSTRACT

*A strong association exists between eating pattern and nutrient intakes and women's reproductive outcomes. The present study thus aimed at seeing the effects of these parameters on infertility.*

*To see the effect on infertility a comparison was made with fertile women using a pretested questionnaire in which information was collected about eating pattern and nutrients intake. The samples of 120 women (60 fertile and 60 infertile women) were collected from Nowrosjee Wadia maternity hospital, Parel, Mumbai. The subjects included in the study were between 25-32 year old women and all of them were from low socioeconomic background. About 80% of them were Hindus. Most of the subjects were from Maharashtra. In all 75% women were found to be not working and 25% were doing either service or business. Working women were found to be higher in infertile women. Very few women were found to be having medical problems. All infertile and fertile women were married since 5-10 years. All fertile women had their first child in between 1 to 3 years of married life.*

*In this study it was observed that the nutrient intakes were higher in fertile women. A detailed 24 hour recall was done for three days for a sub sample of 60 women (30 infertile and 30 fertile) for the assessment of nutritional status. Highly significant result was found in nutrient intake such as calorie ( $t=.011^{**}$ ), protein ( $t=.000^{**}$ ), folic acid ( $t=.011^{**}$ ), iron ( $t=.002^{**}$ ), zinc ( $t=.000^{**}$ ) in sample. It was seen that higher percentage of infertile women had less iron, zinc, folic acid, calories and protein. The intake of these nutrients was higher in fertile women.*

*From this study we can conclude that dietary patterns and nutrients intake may be important modifiable factors that can significantly show positive impact on women's reproductive health.*

**Key words:** Infertility, Non vegetarian foods, nuts consumption, calories, vitamin A, vitamin C, B12, folic acid, iron, zinc.

### INTRODUCTION

Infertility is the inability to get pregnant after a year of unprotected intercourse. According to McLaren J.F. it has a global prevalence of 12 % to 15 %<sup>19</sup>. Estimates of infertility vary

widely among Indian states from 3.7 per cent in Uttar Pradesh, Himachal Pradesh and Maharashtra to 5 per cent in Andhra Pradesh and 15 per cent in Kashmir.

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Moreover, the prevalence of primary infertility has also been shown to vary across tribes and castes within the same region in India<sup>1</sup>.

The causes of infertility are damage to the fallopian tube, hormonal problems, scarred ovaries, premature menopause, endometriosis, cervical problems, polycystic ovarian syndrome which can be treated by assisted reproductive techniques. Also there is increased risk of uterus and tube infection (salpingitis) and adhesion with aging which can lead to infertility. Polycystic ovary syndrome (PCOS) is the most common endocrine disorder in women of reproductive age, affecting up to 10% of women<sup>3,19,29</sup>. Fibroids are the most common benign tumors of female reproductive tract. They lead to pelvic pain, abnormal vaginal bleeding, and pressure on the bladder, miscarriage and infertility<sup>13</sup>.

Eating disorders also adversely affect menopause, fertility and maternal and fetal health. Women suffering from oligomenorrhoea and amenorrhoea have 58% chances of irregular menopause. Nearly 20.7% of infertile have eating disorders<sup>27</sup>

The vegetarian diet decreases luteinizing hormone (LH) values during the midcycle and the luteal phase of menstrual cycle. Estradiol (E2) and progesterones (P) values are also significantly lower during the luteal phase. In contrast, the nonvegetarian diet does not show significant reduction of LH, E2, and P values during any part of the menstrual cycle. The nonvegetarian diet maintains ovulatory cycles with no changes in cycle length or in the length of the follicular phase<sup>25</sup>. A dietary intervention study showed that changing from a diet high in animal fat and protein to one that was high in vegetable fat and protein reduced circulating estrogen levels by more than 40%<sup>5</sup>.

Kuhnlein *et al*<sup>14</sup>, says that Vitamin A deficiency occurs when body stores are depleted to the extent that physiological functions are impaired. The main causes are inadequate intake of vitamin A rich foods and severe and repeated illnesses. Iron deficiency is prevalent in all groups in India, but adverse consequences are most common among pregnant women, preschool children and women of reproductive age. These nutrients play vital role in reproductive health<sup>14,23</sup>. The study conducted by Chevarro *et al*<sup>6</sup>, on 17,544 women concluded that without a

history of infertility for 8 years as they tried to become pregnant or became pregnant. A dietary score based on factors previously related to lower ovulatory disorder infertility (higher consumption of monounsaturated rather than trans fats, vegetable rather than animal protein sources, low glycemic carbohydrates, high fat dairy, multivitamins, and iron from plants and supplements) and other lifestyle information was prospectively related to the incidence of infertility. The majority of infertility cases due to ovulation disorders may be preventable through modifications of diet and lifestyle. Nutrients such as carbohydrates, proteins, fats, vit A, vit C, folic acid, vit B12, iron, zinc and selenium play a vital role in treatment of infertility with proper physical activity<sup>1,6,9,11,17,18,22,24,26</sup>. Folic acid deficiency, extreme exercise and high perceived level of stress are also lead to infertility in women<sup>16</sup>. According to Lakshmaiah N *et al*<sup>15</sup>, legumes and green leafy vegetables are considered to be rich in folate activity. Supplementation of iron and vitamins thrice a week can reduce the risk of infertility through affecting ovarian function<sup>7</sup>.

According to the observational study conducted on 300 female infertile patients the major risk factors for infertility are women who having BMI <20 or  $\geq$  25 kg/m<sup>2</sup>, dieting and unrealistic weight goals potentially limiting energy and essential nutrients, who has eating disorders, vegetarianism, low fat low cholesterol diets and dietary supplements use<sup>16</sup>. Infertility treatment in PCOS is adversely affected due to obesity<sup>20</sup>. A Mediterranean food pattern is not associated with weight gain and considered as long-term weight management. The consumption of legumes, nuts and seeds, and a decrease in the consumption of sweets, were associated with some beneficial changes in anthropometric profile<sup>12</sup>.

Thus keeping the above points in mind this study has been designed to see the impact of dietary pattern and nutrients intake on infertile and fertile women. This study focused on reasons for infertility.

## MATERIALS AND METHODS

The data of infertile and fertile women was collected to do a comparative study. Ethical permission for this research study was obtained from Institutional Ethics Committee –Nowrosjee Wadia Maternity Hospital, Parel, Mumbai.

Sample of 120 women were collected (60 infertile women who were not able to conceive even after 5 -10 years of marriage and 60 fertile women, who conceived in the first to third year of marriage). Detail assessment of these women was done using a pretested questionnaire. The questionnaire included background information. Medical history questions such as diabetes, CVD, hypertension etc. Menstrual history, genetic disorder, heredity and if subject had gone through any major medical surgery were also collected.

To understand the eating patterns of the subjects, questions such as vegetarian/ non vegetarian, frequency of eating non-veg food if non vegetarian, fruit and milk consumption frequency and types, type of grains , type and amount of oil consumption, frequency of green leafy vegetable consumption and dry fruit consumption, any restricted food in family were asked using pretested questionnaire.

A 24 hours diet recall method was used to assess the nutritional status of the 120 women. A 24 hour recall for three days was done on a sub sample of 60 women (30 infertile and 30 fertile) for the assessment of nutritional status.

#### Statistical Analysis

The results were analysed through SPSS (STATISTICAL PACKAGE OF SOCIAL SCIENCES). Descriptive statistics were used to determine means and standard deviations, while correlation coefficients were used for analysing and interpreting the data to enable inferences to be drawn.

**Table 1: Vegetarian or Non-vegetarian intake in sample**

	Infertile Women (N=60)	Fertile Women (N=60)	Pearson Chi-Square	Df	Significant (2 tailed)
Vegetarian	18.3 %	15 %	.240	1	.624
Non-Vegetarian	81.7 %	85 %			

No significant difference was found in the current study when vegetarian and non-vegetarian food consumption were compared as can be seen in table no 1. In the present study 81.7% infertile and 85% fertile women were non-vegetarian while 18.3% infertile and 15% fertile women were vegetarian.

**Non-vegetarian food consumption in sample:** Animal-derived foods possibly contain endogenous estrogens or estrogen metabolites, and as a result, their consumption

Ethical permission for this research study was also obtained from Institutional Ethics Committee- Seva Mandal Education Society.

## RESULTS AND DISCUSSION

The present study on infertile women was conducted to understand the dietary pattern and nutrients intake which could affect them from conceiving. Information was also collected from fertile women for comparison purposes. The study was carried out in "Nowrosjee Wadia Maternity Hospital", Parel, Mumbai. Total of 120 women in the age group of 25-32 years were selected for the study, in which 60 infertile women were selected who were not conceiving even after 5 -10 years of marriage and 60 fertile women who were selected who conceived in 1-3 years after marriage without any treatment.

#### Dietary information:

**Vegetarian or Non-vegetarian food intake in sample:** According to Pirke *et al*<sup>25</sup>, the vegetarian diet decreases luteinizing hormone (LH) values during the midcycle and the luteal phase of menstrual cycle. Estradiol (E2) and progesterone (P) values are also significantly lower during the luteal phase. In contrast, the non-vegetarian diet does not show significant reduction of LH, E2, and P values during any part of the menstrual cycle. The non-vegetarian diet maintains ovulatory cycles with no changes in cycle length or in the length of the follicular phase<sup>25</sup>.

might directly contribute to human circulating steroid hormone concentrations. Alternatively, consumption of these foods might influence endogenous steroid hormone production indirectly through their nutrient components<sup>5</sup>. While another study shows consumption of red meat and high BMI are negatively affects the implantation rate and the likelihood of pregnancy while consumption of cereals, vegetables and fruits have positive effect on the embryo quality at the cleavage stage<sup>16</sup>.

**Table 2: Non-vegetarian food consumption in sample**

Foods	GRP	N	Mean	Std. Deviation	Std. Error Mean	t-value	Significant (2 tailed)	P value
1.Egg	Infertile women	60	1.25	1.398	.180	1.892	118	.061
	Fertile women	60	1.73	1.401	.181			
2.Chicken	Infertile women	60	.85	1.022	.132	.664	118	.508
	Fertile women	60	.98	1.172	.151			
3. Fish	Infertile women	60	1.08	1.154	.149	.682	118	.497
	Fertile women	60	.95	.982	.127			
4. Meat	Infertile women	60	.15	.481	.062	2.182	118	.031*
	Fertile women	60	.48	1.081	.140			

(\*significance at 0.05 level, \*\* high level of significance 0.01 level)

The study showed no significant result in egg, fish and chicken consumption. But it was showing significant result in meat consumption ( $p = .031^*$ ). The intake of meat and also egg and chicken was higher in fertile women than infertile women (Table 2).

**Frequency of Nuts and Dried fruits consumption in sample:** Eating meals that include nuts do not lead to a higher BMI or body weight gain. Nuts also contain fiber or calcium, which may have an effect on body weight regulation and insulin sensitivity<sup>10</sup>. According to the observational study conducted on 300 female infertile patients the major risk factors for infertility are women who having BMI <20 or  $\geq 25$  kg/m<sup>2</sup>, dieting and unrealistic weight goals potentially limiting energy and essential nutrients, who has eating disorders, vegetarianism, low fat low cholesterol diets and dietary supplements

use<sup>16</sup>. Infertility treatment in PCOS is adversely affected due to obesity<sup>20</sup>. Consumers of dried fruit had significantly higher intakes of calcium, phosphorus, magnesium, iron, zinc, copper, and potassium and significantly lower intakes of sodium. Consumers of nuts also had significantly higher energy intakes, about 200 kcal more, on days that nuts were consumed, than non-consumers. However despite the significant increase in energy intake, there was no increase in BMI or waist circumference of consumers of nuts<sup>2</sup>. A Mediterranean food pattern is not associated with weight gain and considered as long-term weight management. The consumption of legumes, nuts and seeds, and a decrease in the consumption of sweets, were associated with some beneficial changes in anthropometric profile<sup>12</sup>.

**Table 3: Frequency of Nuts and Dried fruits consumption in sample**

Frequency of nuts and dried fruit consumption	Infertile Women (%)	Fertile Women (%)	Pearson Chi-Square Value	Df	Significant (2 tailed)
	N=60	N=60			
0	51.7	56.7	11.861	5	.037*
1	18.3	5			
2	5	6.7			
3	10	1.7			
4	1.7	6.7			
7	13.5	23.3			

(\*significance at 0.05 level, \*\* high level of significance 0.01 level)

Table 3 shows significant result ( $p = .037^*$ ) in Nuts and Dried fruits consumption in sample. Intake of nuts and dried fruits was higher in fertile women than infertile women. As can be seen in the table 50% of infertile and fertile women were not consuming nuts and dried fruits. It might be due to they are low socio economic background and could not afford to purchase nuts and dried fruits. But about 23.3 % fertile women were taking nuts and dried fruits daily.

**Frequency of Green leafy vegetables consumption in sample:** According to Lakshmaiah N *et al*<sup>15</sup>, legumes and green leafy vegetables are considered to be rich in folate activity. A diet high in synthetic FA reduced the risk of anovulatory cycles among women without a history of infertility<sup>8</sup>. Folic acid deficiency, extreme exercise and high perceived level of stress are also lead to infertility in women<sup>16</sup>.

**Table 4: Frequency of Green leafy vegetables consumption in sample (N=120)**

Frequency of Green leafy vegetables Consumption	Infertile Women (%)	Fertile Women (%)	Pearson Chi-Square Value	Df	Significant (2 tailed)
	N=60	N=60			
0	16.7	0.0	32.223	7	.000**
1	26.7	8.3			
2	25	13.3			
3	21.7	40			
4	3.3	15			
5	0.0	6.7			
6	1.7	3.3			
7	5	13.3			

(\*significance at 0.05 level, \*\* high level of significance 0.01 level)

In this study highly significant correlation ( $p=.000^{**}$ ) was found with green leafy vegetable consumption in both the group. The table 4 shows that most of the fertile women (40 %) were having green leafy vegetables thrice per week. Frequency of green leafy vegetables consumption was higher in fertile women than in infertile women.

Consumption of red meat and high BMI are negatively affecting the implantation rate and the likelihood of pregnancy while consumption of cereals, vegetables and fruits have positive effect on the embryo quality at the cleavage stage<sup>16</sup>. High fruits, vegetables and monounsaturated fats consumption also has been associated with lower body mass index<sup>4</sup>. Present study shows no significant result in fruit consumption in sample. Also there no significant result was found in milk consumption in sample.

Trans Fatty Acids worsen insulin resistance, particularly among predisposed individuals, such as those with pre-existing insulin resistance, visceral adiposity or lower physical activity and may be causing further weight gain and diabetes incidence in humans. TFA consumption promotes weight gain, particularly accumulation of abdominal fat<sup>21</sup>. There are emerging evidence that suggests potential links between some dietary fatty acids and improved fertility, because specific fatty acids may affect prostaglandin synthesis and steroidogenesis<sup>28</sup>. Intake of unsaturated fat instead of trans fats reduces risk of fertility due to impaired ovulation<sup>27</sup>. In current study, samples were asked about type of oil they consume. None of them used hydrogenated oil

for cooking. All of them were using vegetable oil such as sunflower oil, groundnut oil, mustard oil and rice bran oil.

The women were asked how frequently they take milk and about the type of milk. Around 40% of fertile and 31.7% infertile women were taking milk daily. Most of the fertile women were taking milk once, twice or thrice a week. 41% infertile women were taking whole cow's milk and 5% were taking buffalo's milk, while 38.3% fertile women were having whole cow's and 15% were taking buffalo's milk. Only 1.7% infertile women were taking skimmed milk. The current study showed that milk consumption was higher in fertile women as compared to infertile women.

**Nutrient intake of sample:** The study conducted by Chevarro *et al*<sup>6</sup>, on 17,544 women concluded that without a history of infertility for 8 years as they tried to become pregnant or became pregnant. A dietary score based on factors previously related to lower ovulatory disorder infertility (higher consumption of monounsaturated rather than trans fats, vegetable rather than animal protein sources, low glycemic carbohydrates, high fat dairy, multivitamins, and iron from plants and supplements) and other lifestyle information was prospectively related to the incidence of infertility. The majority of infertility cases due to ovulation disorders may be preventable through modifications of diet and lifestyle. Nutrients such as carbohydrates, proteins, fats, vit A, vit C, folic acid, vit B12, iron, zinc and selenium play a vital role in treatment of infertility with proper physical activity<sup>1,6,9,11,17,18,22,24,26</sup>.

**Table 5: Nutrient intake of sample**

	GRP (Women)	N	Mean	Std. Deviation	Std. Error Mean	T	Df	Significant (2 tailed)
Calorie	Infertile	30	1126.8735	224.30119	40.96161	2.644	58	.011**
	Fertile	30	1277.5989	217.22652	39.65996			
Protein	Infertile	30	29.8814	7.21976	1.31814	3.721	58	.000**
	Fertile	30	36.7108	6.99344	1.27682			

<b>Fat</b>	Infertile	30	48.0551	15.57531	2.84365	.301	58	.764
	Fertile	30	46.7849	17.03465	3.11009			
<b>Vit A</b>	Infertile	30	1211.5609	716.58406	130.82975	.797	58	.429
	Fertile	30	1385.3132	955.34694	174.42169			
<b>Vit C</b>	Infertile	30	39.7097	18.78906	3.43040	1.537	58	.130
	Fertile	30	47.8970	22.32932	4.07676			
<b>Folate</b>	Infertile	30	95.2758	36.65135	6.69159	3.920	58	.000**
	Fertile	30	131.0598	34.00639	6.20869			
<b>Iron</b>	Infertile	30	8.8916	2.97966	.54401	3.190	58	.002**
	Fertile	30	11.4791	3.29590	.60175			
<b>Zinc</b>	Infertile	30	3.4147	1.03362	.18871	3.994	58	.000**
	Fertile	30	4.4396	.95217	.17384			
<b>B12</b>	Infertile	30	.1527	.15026	.02743	1.497	58	.140
	Fertile	30	.2352	.26217	.04787			

A detailed 24 hour recall was done for 3 days for a sub sample of 60 women (30 infertile and 30 fertile) for the assessment of nutritional status. Highly significant result were found in nutrient intake such as calorie ( $t=.011^{**}$ ), protein ( $t=.000^{**}$ ), folate ( $t=.011^{**}$ ), iron ( $t=.002^{**}$ ), zinc ( $t=.000^{**}$ ) in the sample (Table 5). It was seen that higher percentage of infertile women had less iron, zinc, folate, calories and protein. The intake of these nutrients was higher in fertile women. Good result would be found after evaluating more number of subjects.

### CONCLUSION

In conclusion the study shows significant correlations in meat consumption ( $p=.031^{*}$ ). The intake of meat [egg and chicken] nuts, dry fruits, and green leafy vegetable consumption was found to be higher in fertile women than in infertile women. Green leafy vegetables are considered a good source of folic acid. In this study highly significant result ( $p=.000^{**}$ ) was found in green leafy consumption in the sample. It was observed that the nutrient intakes were higher in fertile women. Highly significant results were found in calorie ( $t=.011^{**}$ ), protein ( $t=.000^{**}$ ), folic acid ( $t=.011^{**}$ ), iron ( $t=.002^{**}$ ), zinc ( $t=.000^{**}$ ) intakes. In this study different aspect of dietary pattern and nutrient intake and their relationship with infertility have been addressed.

Review of literature also showed association between eating pattern and nutrients intake like folic acid, iron, selenium, zinc, vitamin A and women's reproductive health and overall health. Dietary patterns are important modifiable factors that can significantly show positive effect on women's reproductive health.

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