How to Cite:
Gaber, M. A., Zeid, H. H. M. A., & Alghalban, Y. A. R. (2024). Nutrition's effect on male fertility: A retrospective study. *International Journal of Health Sciences*, *8*(S1), 295–309. https://doi.org/10.53730/ijhs.v8nS1.14757

Nutrition's effect on male fertility: A retrospective study

Mohammed A. Gaber
MD, Dermatology Andrology and STDs, Faculty of Medicine, Menoufia University, Menoufia Egypt

Hanan Hamdy Mohammed Abu Zeid
M.B.B. Ch, Dermatology Andrology and STDs, Faculty of Medicine, Menoufia University, Menoufia Egypt
Corresponding author email: Hnanamohammed@gmail.com

Yousra A. R Alghalban
MD, Public Health and Community Medicine, Faculty of Medicine, Menoufia University, Menoufia, Egypt

***Abstract*---**Objective: The aim of this study was to clarify the effect of food on male fertility in a sample of Egyptian men. Background: Eating a varied and healthful diet may be an essential aspect of sustaining good overall health. However, specific vitamins and food groups may have a more substantial impact on reproductive health than others. A male's diet may affect his fertility. Method: Type of study Case control nested in a cross-sectional study It was conducted during the period from September 1st, 2021, to 1st of September 1st, 2022, in Dermatology and Andrology Outpatient Clinic in Menoufia University. Results: The results Twenty hundred and fifty-seven married men who have a regular sexual relation, eating different types of food accepting to participate in this study, the highest percentage of the participants were from urban areas, aged 30-39 years, weighed more than 90 kg, were 170-180 cm tall and had secondary education. Conclusion: Nutrition can both negatively and positively affect the quality of semen. The diet should include vegetables and fruit, fish and seafood, nuts, seeds, whole-grain and fibre-rich products, poultry, and low-fat dairy products.

***Keywords*---**male fertility, date palm, nutrition, royal jelly.

Introduction

Infertility places a significant burden on individuals, families, and the wider community and impacts more than 45 million couples worldwide. Treatment for infertility includes simple interventions such as fertility awareness and lifestyle advice (counselling about weight, diet, physical activity, and/or smoking) to more complex assisted reproductive technologies such as in vitro fertilization (IVF). Lifestyle factors such as weight, diet, physical activity, and smoking may affect fertility and the chance of people with infertility having a baby. However, guidelines about what preconception lifestyle advice should be offered are lacking (Boedt et al., 2021).

Infertility may be due to male factors, female factors, or a combination of both, and in 20% of cases, the cause of infertility is unknown (Deshpande & Gupta, 2019). Male factor infertility accounts for 40% of infertility cases. Spermatogenetic failure, including azoospermia and oligospermia, is one of the important causes of male infertility. Among different methods, medicinal plants have been used in many Nations to treat male infertility problems (Khojasteh, Khameneh, Houresfsnd, & Yaldagard, 2016).

Nejatbakhsh, Shirbeigi, Rahimi, & Abolhassani, (2016) added not only semen deficiency or abnormality (testicular dysfunction) and anatomical abnormalities in the male reproductive system (obstructive azoospermia) have been discussed in complementary alternative medicine evidence as causes of male infertility, but also decreased libido and erectile dysfunction because of their general effect on the impairment of sexual functions.

A decrease in male fertility has been occurred over the years. Sperm density had fallen by 40% over the past 50 years. One of the reasons for the impaired semen parameters over the years is dietary factors. The significant effects of dietary fatty acids (FAs) on male fertility have been well documented both in animals and human studies. The first mechanism by which omega-3 and omega-6 PUFAs affect spermatogenesis, is by the incorporation into spermatozoa cell mem- brane. Omega-3 and omega-6 PUFAs are structural components of cell membranes (Reza Safarinejad & Safarinejad, 2012).

Treatment for people with infertility is referred to as medically assisted reproduction (MAR) and includes assisted reproductive technologies (ART) such as in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI). These treatments have large financial and biopsychosocial costs for individuals and for the community. Therefore, improving treatment success rates and reducing this burden are important research priorities in reproductive medicine (Boedt et al., 2021).

While searching the available database on the association between food and male fertility, a little comprehensive research was found. Therefore, the aim of this study is to search deeper in the relation between certain types of food and male fertility such as date palm, royal jelly, oily fish etc.

Methodology

Case control nested in a cross-sectional study was conducted during the period from September 1st, 2021, to 1st of September 1st, 2022, in Dermatology and Andrology Outpatient Clinic in Menoufia University. Two hundred and fifty-seven married men who have a regular sexual relation, eating different types of food accepting to participate in this study. Including married men aged 20-50 years and have a stable marital state in the last 6 months with active sexual life. Excluding married male outpatient who were:

1. Having medical conditions such as heart disease, hypertension, diabetes, or other serious diseases which restrict sexual activity or with a psychiatric condition that makes completion of the questionnaire impossible.
2. Vegetarians.
3. Divorced.
4. Widowed.
5. Illiterate.
6. Very poor.

Sample size was calculated based on review of past literature Younis et al., (2020) using open epi program version 3 with power of study 80% and confidence level is 95% to be at least 254 participants. We started with 270 participants who agreed to be a part of this study: taking into consideration a dropout rate of (5%) due to incomplete questionnaires or inconsistency in responses in the questionnaires. We ended with 257 participants with complete questionnaires with a response rate (95.2%).

- A formal consent was taken from recruited participants after explaining the aim, benefits and harms and schedule work of the study.
- All participants were subjected afterwards to:
  A Questionnaire involving
  a) Sociodemographic data: e.g., age, residence, weight, height, and educational level.
  b) Male fertility questionnaire: e.g., ability to conceive current wife, semen analysis, medical and drug history (induction and anabolic drugs) related to fertility of the male and his spouse, and smoking.
  c) Eating habits questionnaire including
- Addition of food supplements- in the form of recipes- culturally believed and have limited scientific evidence to improve fertility in males to their diet e.g., “Date palm, RJ, Lepidium sativum, Ginseng, Maca roots.....etc. and duration of consumption.
- Inclusion of certain food culturally believed to improve fertility in males to their diet.
- Avoidance of certain food culturally believed to decrease fertility in males to

their diet.

- Pattern of eating: favorite type of meals, number of meals, meat, and Vitamins.
- Approval from Ethical Committee and the department of Dermatology and Andrology, Faculty of Medicine, Menoufia University was taken before the beginning of this study. Before the interview, written consent was obtained from the participants after explaining the aims and benefits of the study. They were reassured about the strict confidentiality of any obtained information, and that the study would be used only for the purpose of research.

Data were collected, tabulated, statistically analyzed using an IBM personal computer with Statistical Package of Social Science (SPSS) version 20 (IBM Corporations, 2011), Armonk, NY and Epi Info 2000 programs, where the following statistics were applied.

a) Descriptive statistics: in which quantitative data were presented in the form of mean ($\underline{\mathbf{X}}$), standard deviation (SD), range, and qualitative data were presented in the form numbers and percentages (%).
b) Analytical statistics:
   - Chi- squared test (x^2) was used to study association between two qualitative variables.
   - Mann-Whitney test is a test of significance used for comparison between two groups not normally distributed having quantitative variables.
   - Spearman correlation coefficient test (r-test) is a test of significance used to study the correlation between nonparametric quantitative variables. Correlation coefficient test (r- test) results may be positive (+) correlation or negative (-) correlation. It is used to quantify the strength of the linear relationship between two variables.
   - P-value of (>0.05) was considered not statistically significant.
   - P-value of (≤0.05) was considered statistically significant.
   - P-value of (≤0.001) was considered statistically highly significant.

Results

Among the 257 recruited participants, the highest percentage of the participants were from urban areas, aged 30-39 years, weighed more than 90 kg, were 170-180 cm tall and had secondary education (70.4, 73.5, 36.2, 47.1 and 64.6%, respectively). Table 1

73.2 % had normal semen analysis of the recruited participants. Figure 1. The percentages of natural fertility supplement usage of Royal jelly, Date palm, Omega 3 containing foods, nigella sativa, mountain sidr honey, Maca roots, and Ginseng were (45.9%, 41.2%, 35%, 5.1%,5.1%, 2.3%, 2.3% respectively). Normal semen analysis was statistically significantly higher in participants with date palm and royal jelly usage. (p≤0.05), There was no statistically significant difference in semen analysis in the recruited participants in relation to other natural fertility supplement usage e.g., Nigella sativa, Ginseng, Maca roots, Mountain sidr honey, Lepidium sativum(P>0.05). Table 2

Food culturally known to increase fertility as eggs, banana, garlic, oily fish, honey, dark chocolate, tomatoes, olive oil, beef, and lean meats were included in participants' diet with percentage of (63%, 49%, 52.9%, 72.3%,45.5%, 10.5%, 49.8%, 26.8%, 57.2%, and 22.6% respectively). In addition, the table reveals that, egg, banana, garlic, oily fish, and tomato usage as a natural fertility supplement was statistically significantly higher in participants with normal semen analysis in the recruited participants ($P<0.05$). in contrast, the table shows no statistically significant difference in semen analysis in the recruited participants in relation to honey, dark chocolate, olive oil, beef, lean meats. Table 3

In relation to food negatively affecting fertility as fried food, processed meat and caffeine were included in participants' diet with percentage of (74%, 32% and 25%). Furthermore, there was no statistically significant difference in semen analysis in the recruited participants in relation to food culturally known to have a negative effect on fertility ($P>0.05$). Table 4

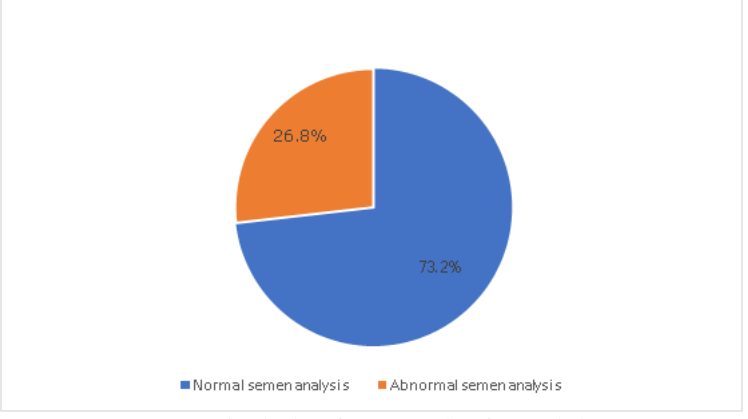

Figure 1 Semen analysis in the recruited participants (no=257)

Table 1. Semen analysis in relation sociodemographic data of the recruited participants (no=257)

Items	Normal semen (No=188)		Abnormal semen (No=69)		Total participants (No=257)		Test of significance and p-value
	No	%	No	%	No	%	
Residence							
- Rural	56	29.8	20	29	181	70.4	X^2= 0.016
- Urban	132	70.2	49	71	76	29.6	p =0.901 (>0.05)
Age in years							
- 20-29	9	4.8	2	2.9	11	4.3	
- 30-29	138	73.3	51	74	189	73.5	X^2= 0.985
- 40-49	37	19.8	14	20.3	51	19.8	p =0.912 (>0.05)
- 50-59	3	1.6	1	1.4	4	1.6	
- >60	1	0.5	1	1.4	2	0.8	
Weight in kilograms							
- 60-69	15	8	7	10.1	22	8.6	

- 70-79	54	28.7	29	42	83	32.2	X^2= 5.09
- 80-89	46	24.5	13	18.9	59	23	p =0.165 (>0.05)
- >90	73	38.8	20	29	93	36.2	
Height in centimeters							
- Less than 160 cm	11	5.9	6	8.7	17	6.6	
- 160 to 169 cm	59	31.3	25	36.3	84	32.7	X^2= 1.91
- 170 to 180 cm	90	46.9	31	44.9	121	47.1	p =0.591 (>0.05)
- >180 cm	28	14.9	7	10.1	35	13.6	
Education							
- Can read & write.	1	0.5	1	1.4	2	0.8	X^2= 1.207
- Secondary school	119	63.3	47	68.2	166	64.6	p =0.547 (>0.05)
- University degree	68	36.2	21	30.4	89	34.6	

X^2 chi square test

Table 2. Semen analysis in relation natural fertility supplement in the recruited participants (no=257)

Items	Normal semen (No=188)		Abnormal semen (No=69)		Total participants (No=257)		Test of significance and p-value
	No	%	No	%	No	%	
Date palm							
- Yes	106	56.4	0	0	106	41.3	X^2= 66.2
- No	82	43.6	69	100	151	58.7	p =0.00** (≤0.001)
Royal jelly							
- Yes	118	62.8	0	0	118	45.9	X^2= 80.1
- No	70	37.2	69	100	139	54.1	p =0.00** (≤0.001)
Nigella sativa							
- Yes	11	5.9	2	2.9	13	5.1	X^2= 0.916
- No	177	94.1	67	97.1	244	94.9	p =0.338 (>0.05)
Mountain Sidr Honey							
- Yes	11	5.9	2	2.9	13	5.1	X^2= 0.916
- No	177	94.1	67	97.1	244	94.9	p =0.338 (>0.05)
Omega 3 containing foods							
- Yes	66	35.1	24	34.8	90	35	X^2= 0.002
- No	122	64.9	45	65.2	167	65	p =0.962 (>0.05)
Ginseng							
- Yes	5	2.7	1	1.4	6	2.3	X^2= 0.324
- No	183	97.3	68	98.6	251	97.7	p =0.569 (>0.05)
Maca roots							
- Yes	28	14.9	15	21.7	6	2.3	X^2= 1.69
- No	160	85.1	54	78.3	251	97.7	p =0.183 (>0.05)

X^2 chi square test

Table 3. Semen analysis in relation Food culturally known to increase fertility in the recruited participants (no=257)

Items	Normal semen (No=188)		Abnormal semen (No=69)		Total participants (No=257)		Test of significance and p-value
	No	%	No	%	No	%	
Eggs							
- Yes	155	82.4	7	10.1	162	63	X^2= 113.2
- No	33	17.6	62	89.9	95	37	p =0.00* (≤0.001)
Banana							
- Yes	120	63.8	8	11.5	128	49	X^2= 55.1
- No	68	36.2	61	88.5	129	51	p=0.00* (≤0.001)
Garlic							
- Yes	125	66.5	11	15.9	136	52.9	X^2= 49.8
- No	63	33.5	58	84.1	121	47.1	p =0.00* (≤0.001)
Oily fish							
- Yes	133	70.7	53	76.8	186	72.3	X^2= 12.9
- No	55	29.3	16	23.2	-	-	p =0.00* (≤0.001)
Honey							
- Yes	87	46.3	30	43.5	117	45.5	X^2= 0.159
- No	101	53.7	39	56.5	140	54.5	p =0.690 (>0.05)
Dark chocolate							
- Yes	20	10.6	7	10.1	27	10.5	X^2= 0.013
- No	168	89.4	62	89.9	230	89.5	p =0.999 (>0.05)
Tomatoes							
- Yes	118	62.8	10	14.4	128	49.8	X^2= 122.5
- No	70	37.2	59	85.6	129	50.2	p =0.00** (≤0.001)
Olive oil							
- Yes	52	27.7	17	24.6	69	26.8	X^2= 0.235
- No	136	72.3	52	75.4	188	73.2	p =0.628 (>0.05)
Beef							
- Yes	105	55.9	42	60.9	147	57.2	X^2= 0.519
- No	83	44.1	27	39.1	110	42.8	p =0.471 (>0.05)
Lean meats							
- Yes	39	20.7	19	27.5	58	22.6	X^2= 1.332
- No	149	79.3	50	72.5	199	77.4	p =0.248 (>0.05)

X^2 chi square test

Table 4. Semen analysis in relation to food culturally known to have a negative effect on fertility in the recruited participants' diet (no=257)

Items	Normal semen (No=188)		Abnormal semen (No=69)		Total participants (No=257)		Test of significance and p-value
	No	%	No	%	No	%	
Fried food							
- Yes	55	29.3	19	27.5	74	28.7	X^2= 0.073
- No	133	70.7	50	72.5	183	71.2	P =0.787 (>0.05)
Processed meats							
- Yes	12	6.4	20	29	32	12.4	X^2= 0.027
- No	176	93.6	49	71	247	96.1	P =0.868 (>0.05)
Caffeine							
- Yes	18	9.6	7	10.1	25	9.7	X^2= 0.019
- No	170	90.4	62	89.9	232	90.3	P =0.891 (>0.05)

X^2 chi square test

Discussion

Nutrition can affect, negatively or positively, sperm quality, and this effect depends on both quantitative and qualitative aspects of a diet, such as the calorie content of each macronutrient (carbohydrates, proteins, and fats), as well as on the specific fatty acid, carbohydrate, and protein profiles (Ferramosca & Zara, 2022).

The present study was conducted on 257 married men aged from 20-50 years who have a regular sexual relation and eating different types of food. The aim of this study was to clarify the effect of food on male fertility in a sample of Egyptian men.

Urban residents in the current study were 70.4% of the total participants, and there was no statistically significant difference in semen analysis in relation to residence (p>0.05), which can be explained as we don't have clear distinction between urban and rural areas in Egypt. Our results were in coherence with both studies of which also found no significant difference in semen analysis in relation to residence (Sharpe & Irvine, 2004).

According to age 73.3% of the total participants were between 30-39 years, and there was no statistically significant difference in semen analysis in relation to age in the recruited participants (p>0.05). Our results were in concordance with Wang et al., (2022) who found no significant association between age and semen quality of study subjects.

In relation to educational level of study participants 64.6% of them have secondary education. According to current study, there was no statistically significant difference in semen analysis in relation to education in the recruited participants (p>0.05). It could be explained that semen quality mainly relies on physiological factors rather than education level. Our study results were like

Redmon et al., (2013) who found no difference in semen parameters in men with high school education or less.

In relation to weight, 90% of total study participants' weight ranged from 70 to 90+ kg. It was found that there was no statistically significant difference in semen analysis in relation to weight in the recruited participants ($p>0.05$). On the other hand, results of Fejes, Koloszar, Szöllo˝ si, Zavaczki, & Pal, (2005) were against ours as they stated that increased adiposity is related to decreased fertility and negatively affects nearly every semen analysis parameter. Which may be because Body Mass Index (BMI) was self-reported.

In the present work, date palm usage as a natural fertility supplement was consumed by 41.2 % of recruited participants. Normal semen analysis was statistically significant higher in participants who consumed date palm ($p\leq0.001$). Date Palm is known to contain a variety of compounds including amino acids, fatty acids, flavonoids, saponins, and sterols. Owing to its contents it can help treat male infertility (Abdi, Roozbeh, & Mortazavian, 2017). In line with the present work, Bahmanpour et al., (2006) who stated that date palm has been found to enhance sperm motility and viability which contribute to the regulation of spermatogonial stem cells and male reproductive tissues.

According to royal jelly (RJ) usage as a natural fertility supplement, about 45.9% of participants reported its consumption. Normal semen analysis was statistically significant higher in participants who consumed royal jelly p (≤0.001). This could be explained as amino acid content of both honey and royal jelly may play a role as well by enhancing acrosome reaction or improving fertilization and enhancing sperm motility (Zahmatkesh, Najafi, Nejati, & Heidari, 2014) .In agreement of the present results, Mohssin, Al-Sanafi, & Abdulla, (2007) who documented that RJ was traditionally used in treatment of impotence and infertility as it slightly increases sperm count through increasing testosterone level.

According to Nigella sativa, 5.1 % of total recruited participants were consuming it. There was no statistically significant association between its consumption and having a normal semen analysis ($p> 0.05$). This result is supported by Mahdavi, Heshmati, & Namazi, (2015)who concluded that there is insufficient evidence to make recommendations for Nigella sativa use as an adjunct therapy in infertile men.

Pointing to mountain sidr honey, 5.1 % of total recruited participants were consuming it, moreover there was no statistically significant association between its consumption and having a normal semen analysis ($p> 0.05$). In the same line Meo, Al-Asiri, Mahesar, & Ansari, (2017) agreed with our result, they reported that it is recommended that honey is a valuable dietary supplement. However, the use of honey hasn't proved to be beneficial in subjects with infertility.

In relation to lean meat, 22.6 % of total recruited participants consumed it. Notably, there was no statistically significant association between the consumption of Lean meats and having a normal semen analysis ($p>0.05$). This result was similar to Maldonado & Alsayouri, (2019)who stated that meat intake was unrelated to semen quality or reproductive hormone levels. According to Ginseng, 2.3 % of total

recruited participants consumed it moreover, there was no statistically significant association between its consumption and having a normal semen analysis (p> 0.05). Our study disagreed with Leung & Wong, (2013) who stated that use of ginseng is important for the development of novel therapeutics or to increase the effectiveness of the current treatment strategies for male reproductive disorders.

In the present study 16.7 % of total participants were consuming maca roots, in addition there was no statistically significant association between its consumption and having a normal semen analysis (p > 0.05). Our result was similar to Lee, Lee, Qu, Lee, & Kim, (2022) who reported that results suggest unclear effects of maca on semen parameters in men experiencing infertility.

The present findings revealed that 72.3% of total participants were consuming oily fish, in addition normal semen analysis was statistically significant higher in participants who consumed oily fish (p≤0.001). It is explained as Oily fish, such as, mackerel, and sardines, which are available in Egyptian markets, are rich in omega-3 fatty acids which is linked to improve sperm motility and count. Reza Safarinejad & Safarinejad, (2012) has the same findings as they recorded better semen analysis with diets rich in fish.

Moreover 63 % of recruited participants were including eggs in their meals, normal semen analysis was statistically significant higher in participants who consumed eggs (p≤0.001). It could be explained as eggs including high-quality protein, minerals (such as selenium and zinc), and antioxidants. These nutrients play important roles in reproductive health. (Eslamian et al., 2016) supported the present findings as they recorded better semen analysis with diets rich in eggs.

In the present results 28.8% and 17.5% of total recruited participants consumed fried food and junk food, respectively. also, there was no statistically significant association between the consumption of them and having a normal semen analysis (p >0.05). In line with the present results, Gaskins & Chavarro, (2018) reported no significant association between the sperm quality parameters and adherence to a Western dietary pattern, characterized by a high intake of refined grains, pizza, snacks, high-energy drinks, and sweets. In disagreement of the present results, Danielewicz, Przybyłowicz, & Przybyłowicz, (2018) indicated that junk foods (e.g. sweets and snacks, and refined grain products) were associated with an increased risk of reduced motility, total sperm count, and abnormal sperm morphology.

Furthermore 12.1 % & 12.4% of total recruited participants consumed full fat dairy and processed meat, respectively. Also, there was no statistically significant association between the consumption of full fat dairy, processed meat and having a normal semen analysis (p >0.05). In line with the present results**,** Gaskins & Chavarro, (2018) reported no significant association between the sperm quality parameters and high intake of red and processed meat. In disagreement with present results, Afeiche et al., (2014) who suggested that a high intake of processed red meat and trans-fatty acids reduces the total sperm count and semen quality.

In the present data, (24.1%, 7.1%, 2.3%, 6.6%) of total participants were receiving Multivitamins, Vit D, Vit B, and omega 3, respectively. In addition, there was no statistically significant difference in semen analysis in the recruited participants in relation to vitamin intake (P >0.05). Our explanation could be related to inconsistent vitamin intake as daily consumption was not precisely confirmed. Parallel to present data, Abbasihormozi et al., (2017) who observed no associations among serum vitamin D levels, semen quality in the participants.

Pointing to dark chocolate, 10.5 % of the recruited participants were consuming it, and there was no statistically significant association between its consumption as food known culturally increase fertility and semen analysis (p >0.05). Contra wise, Visioli & Hagen,(2011) stated that cocoa and chocolate products have a much higher content – on a per-weight basis – of polyphenols and total antioxidant activity than other polyphenol-containing foods which improve semen parameters.

According to caffeine intake, 9.7 % of total participants consumed it. Also, there was no statistically significant association between its consumption of caffeine and normal semen analysis (p >0.05). In disagreement with present results**,** Ricci et al., (2017) who suggested that a high caffeine intake may negatively affect male reproductive function.

In relation to garlic consumption 52.9% of total recruited participants consumed it. In addition, normal semen analysis was statistically significant higher in participants who consumed garlic (p≤0.001). On the same line Musavi et al., (2018) stated that garlic has the potential to enhance fertility and spermatogenesis by increasing testosterone levels and improving the structure of the testicles. In addition, 64.5 % of total recruited participants were consuming tomato, furthermore, normal semen analysis was statistically significant higher in participants who consumed tomato, and in agreement with current results Yamamoto et al., (2017) reported that tomato seems to improve sperm motility in infertile patients.

Moreover 49.8 % of total recruited participants were consuming banana. In addition, normal semen analysis was statistically significantly higher in participants who consumed banana. On the same line with current findings Chiu et al., (2016) mentioned that banana's consumption was positively related to sperm counts in young men.

Limitations and Recommendations

The results of the current study should be interpreted in light of its limitations, as the present study included a relatively small sample size and conducted in specific geographical area. So, the following recommendations were suggested.

- Further studies should be conducted including larger sample size and different geographical places in Egypt.
- Large-scale multi-centered studies should be conducted to further establish the relationship between healthy food and semen quality parameters in Egyptian participants.

- Compare the fertility outcomes of individuals with diverse dietary habits to discern patterns and correlations.
- Conduct a longitudinal study to examine the cumulative effects of dietary habits on male reproductive health over time.
- Lifestyle modification, especially regarding to diet, is crucial for improving semen quality and maintaining fertility in men.
- Disseminate research findings through public channels to educate individuals and couples planning to conceive.
- Develop training programs for healthcare professionals to integrate dietary counseling into reproductive health consultations.

Conclusions

Nutrition can both negatively and positively affect the quality of semen. The diet should include vegetables and fruit, fish and seafood, nuts, seeds, whole-grain and fiber-rich products, poultry, and low-fat dairy products. On the other hand, low consumption of fruit and vegetables and products with an antioxidant potential, a high caloric intake, a diet rich in saturated fatty acids and trans fats, low fish consumption, as well as a high proportion of both red and processed meat have a negative impact on the quality of semen, which may contribute to reduce male fertility.

According to current study the inclusion of royal jelly, date palm, oily fish, eggs, garlic, and tomatoes in one's diet has emerged as a promising approach to enhance fertility. These findings not only exhibit the connection between nutrition and reproductive health but also offer valuable insights for individuals seeking to optimize their chances of conception.

Royal jelly which is rich in essential nutrients, proteins, and antioxidants, royal jelly may contribute to reproductive well-being by promoting hormonal balance and supporting overall health. The study suggests that incorporating royal jelly into one's diet could be a beneficial strategy for those aspiring to boost fertility. Similarly, the inclusion of date palm in the list of fertility-enhancing foods is noteworthy. Date palm is advised for its nutritional richness, containing an variety of vitamins, minerals, and antioxidants. Its positive influence on fertility could be attributed to its ability to support hormonal functions and provide essential nutrients crucial for reproductive processes.

Oily fish, known for its high omega-3 fatty acid content, has long been associated with numerous health benefits. The study underscores its positive impact on fertility, emphasizing the role of omega-3 fatty acids in promoting reproductive health. These essential fatty acids contribute to the regulation of hormonal processes and may enhance the quality of male semen characteristics.

Eggs, a dietary source of high-quality proteins and essential nutrients, have consistently demonstrated their positive influence on fertility in the study. The inclusion of eggs in the diet has been associated with improved reproductive. In addition, garlic, a commonly used ingredient with potential health benefits, has been identified in the study as having a positive impact on fertility.

Tomatoes, rich in antioxidants and essential nutrients, also exhibit fertility-enhancing properties according to the study. The inclusion of tomatoes in the diet may contribute to reproductive health, providing individuals with another accessible and flavorful option for supporting fertility.

In summary, the findings of this study emphasize the importance of a diverse and nutrient-rich diet in promoting fertility. While specific dietary elements such as royal jelly, date palm, oily fish, eggs, garlic, and tomatoes have been identified as having positive effects on reproductive outcomes.

References

Abbasihormozi, S., Kouhkan, A., Alizadeh, A., Shahverdi, A., Nasr-Esfahani, M., Sadighi Gilani, M., . . . Zolfaghari, Z. (2017). Association of vitamin D status with semen quality and reproductive hormones in Iranian subfertile men. *Andrology, 5*(1), 113-118.

Abdi, F., Roozbeh, N., & Mortazavian, A. M. (2017). Effects of date palm pollen on fertility: research proposal for a systematic review. *BMC research notes, 10*(1), 1-4.

Afeiche, M. C., Bridges, N. D., Williams, P. L., Gaskins, A. J., Tanrikut, C., Petrozza, J. C., . . . Chavarro, J. E. (2014). Dairy intake and semen quality among men attending a fertility clinic. *Fertility and Sterility, 101*(5), 1280-1287. doi:10.1016/j.fertnstert.2014.02.003

Bahmanpour, S., Panjeh, S. M., Talaei, T., Vojdani, Z., Poust, P. A., Zareei, S., & Ghaemian, M. (2006). Effect of Phoenix dactylifera pollen on sperm parameters and reproductive system of adult male rats.

Boedt, T., Vanhove, A. C., Vercoe, M. A., Matthys, C., Dancet, E., & Lie Fong, S. (2021). Preconception lifestyle advice for people with infertility. *Cochrane Database of Systematic Reviews, 2021*(4). doi:10.1002/14651858.CD008189.pub3

Chiu, Y.-H., Gaskins, A. J., Williams, P. L., Mendiola, J., Jørgensen, N., Levine, H., . . . Chavarro, J. E. (2016). Intake of fruits and vegetables with low-to-moderate pesticide residues is positively associated with semen-quality parameters among young healthy men. *The Journal of nutrition, 146*(5), 1084-1092.

Danielewicz, A., Przybyłowicz, K. E., & Przybyłowicz, M. (2018). Dietary patterns and poor semen quality risk in men: a cross-sectional study. *Nutrients, 10*(9), 1162.

Deshpande, P. S., & Gupta, A. S. (2019). Causes and prevalence of factors causing infertility in a public health facility. *Journal of human reproductive sciences, 12*(4), 287.

Eslamian, G., Amirjannati, N., Rashidkhani, B., Sadeghi, M.-R., Baghestani, A.-R., & Hekmatdoost, A. (2016). Adherence to the Western pattern is potentially an unfavorable indicator of asthenozoospermia risk: a case-control study. *Journal of the American College of Nutrition, 35*(1), 50-58.

Fejes, I., Koloszar, S., Szöllo˝ si, J., Zavaczki, Z., & Pal, A. (2005). Is semen quality affected by male body fat distribution? *Andrologia, 37*(5), 155-159.

Ferramosca, A., & Zara, V. (2022). Diet and male fertility: The impact of nutrients and antioxidants on sperm energetic metabolism. *International Journal of Molecular Sciences, 23*(5), 2542.

Gaskins, A. J., & Chavarro, J. E. (2018). Diet and fertility: a review. *American Journal of Obstetrics and Gynecology, 218*(4), 379-389. doi:10.1016/j.ajog.2017.08.010

Khojasteh, S. M. B., Khameneh, R. J., Houresfsnd, M., & Yaldagard, E. (2016). A review on medicinal plants used for improvement of spermatogenesis. *Biology and Medicine, 8*(4). doi:10.4172/0974-8369.1000292

Lee, H. W., Lee, M. S., Qu, F., Lee, J. W., & Kim, E. (2022). Maca (Lepidium meyenii Walp.) on semen quality parameters: A systematic review and meta-analysis. *Front Pharmacol, 13*, 934740. doi:10.3389/fphar.2022.934740

Leung, K. W., & Wong, A. S. (2013). Ginseng and male reproductive function. *Spermatogenesis, 3*(3), e26391. doi:10.4161/spmg.26391

Mahdavi, R., Heshmati, J., & Namazi, N. (2015). Effects of black seeds (Nigella sativa) on male infertility: A systematic review. *Journal of Herbal Medicine, 5*(3), 133-139. doi:https://doi.org/10.1016/j.hermed.2015.03.002

Maldonado, K. A., & Alsayouri, K. (2019). Physiology, Brain.

Meo, S. A., Al-Asiri, S. A., Mahesar, A. L., & Ansari, M. J. (2017). Role of honey in modern medicine. *Saudi journal of biological sciences, 24*(5), 975-978.

Mohssin, S. A., Al-Sanafi, A. E., & Abdulla, S. M. (2007). Effect of royal jelly on male infertility. *University of Thi-Qar Journal Of Medicine, 1*(1), 1-12.

Musavi, H., Tabnak, M., Sheini, F. A., Bezvan, M. H., Amidi, F., & Abbasi, M. (2018). Effect of garlic (Allium sativum) on male fertility: a systematic review. *Journal of Herbmed Pharmacology, 7*(4), 306-312.

Nejatbakhsh, F., Shirbeigi, L., Rahimi, R., & Abolhassani, H. (2016). Review of local herbal compounds found in the Iranian traditional medicine known to optimise male fertility. *Andrologia, 48*(8), 850-859. doi:10.1111/and.12675

Redmon, J. B., Thomas, W., Ma, W., Drobnis, E. Z., Sparks, A., Wang, C., . . . Swan, S. H. (2013). Semen parameters in fertile US men: the Study for Future Families. *Andrology, 1*(6), 806-814.

Reza Safarinejad, M., & Safarinejad, S. (2012). The roles of omega-3 and omega-6 fatty acids in idiopathic male infertility. *Asian Journal of Andrology, 14*(4), 514-515. doi:10.1038/aja.2012.46

Ricci, E., Viganò, P., Cipriani, S., Somigliana, E., Chiaffarino, F., Bulfoni, A., & Parazzini, F. (2017). Coffee and caffeine intake and male infertility: a systematic review. *Nutrition journal, 16*, 1-14.

Sharpe, R. M., & Irvine, D. S. (2004). How strong is the evidence of a link between environmental chemicals and adverse effects on human reproductive health? *BMJ, 328*(7437), 447-451. doi:10.1136/bmj.328.7437.447

Visioli, F., & Hagen, T. M. (2011). Antioxidants to enhance fertility: role of eNOS and potential benefits. *Pharmacol Res, 64*(5), 431-437. doi:10.1016/j.phrs.2011.06.021

Wang, N., Gu, H., Gao, Y., Li, X., Yu, G., Lv, F., . . . Zhang, S. (2022). Study on influencing factors of semen quality in fertile men. *Frontiers in physiology, 13*, 813591.

Yamamoto, Y., Aizawa, K., Mieno, M., Karamatsu, M., Hirano, Y., Furui, K., . . . Sato, I. (2017). The effects of tomato juice on male infertility. *Asia Pacific journal of clinical nutrition, 26*(1), 65-71.

Younis, I. M., Abdel Khalek, G. M., & Mohammed, H. A. (2021): Effect Of Food On Female Sexuality. Benha Journal of Applied Sciences, 6(3), 279-287

Zahmatkesh, E., Najafi, G., Nejati, V., & Heidari, R. (2014). Protective effect of royal jelly on the sperm parameters and testosterone level and lipid

peroxidation in adult mice treated with oxymetholone. *Avicenna journal of phytomedicine, 4*(1), 43.

	Contributor 1	Contributor 2	Contributor 3
Concepts	√		√
Design	√		√
Definition of intellectual content	√		
Literature search	√	√	
Clinical studies		√	
Experimental studies		√	
Data acquisition	√		√
Data analysis			√
Statistical analysis			√
Manuscript preparation	√	√	√
Manuscript editing		√	√
Manuscript review	√	√	√