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A Critical Study of Role of Diet Consisting Chiefly Milk and Clarified Butter in Spermatogenesis and Black Gram and Sesame Seed Oil in Oogenesis

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Abstract

In the classical literature of Ayurveda, most repetitively prescribed diet by different scholars are the food consisting chiefly gharita (clarified butter) and milk mentioned for men and food consisting chiefly oil of sesame and masha/black gram for the women to be getting a good offspring. As per the principle of line of treatment in Ayurveda the substance (dravya) which have similar properties and panchabhautica composition they will increase the similar dhatu, dosha and mala in the body. So, the milk and ghee (clarified butter) increase the Shukra dhatu and sesame oil and masha (black gram) increases the Artava (seventh number dhatu in females) in the body by their similar composition and properties. As per the modern medical science in the process of spermatogenesis for the growth and maturation of spermatozoon the most required elements are fatty acids, Polyunsaturated Fatty Acid (PUFA) and cholesterol which are present in milk and ghee (clarified butter) in highest ratio, similar as in the process of oogenesis for the growth and maturation of oocyte the most required elements are triglycerides mainly palmitic, stearic, oleic and linoleic acids are present in sesame oil and masha (black gram) in highest percentage.

Keywords: Shukra • Artava • Ghrita • Milk • Sesame oil • Masha • Fatty acids • Cholesterol

Introduction

The union of Shukra (sperm), Artava (ovum) and Atma /Jiva inside the uterus is known as Garbha (fetus) [1]. As all the ancient scholars described that the most essential factors for formation of Garbha is Shukra (sperm), Artava (ovum) both are formed by Rasa-dhatu. Shukra is seventh number dhatu of the body. Here the term Artava term used for stribija, that is similar to Shukra in male. In Ayurvedic literature different Acharyas have prescribed different types of diet for increasing the process of gametogenesis and quality of gametocytes. Achrayas mentioned that the Ghrita (clarified butter) and milk is said to be best to increase Sukra (sperm/ spermatic fluid) in oligospermia and also to the infertile men and adolescents whereas masha(black gram) and sesame oil is best for the women [2] It increases the chance of conception and then at the end it is nourishing to the fetus. The malformed gametes which in turn lead to Garbhsrava (misscarriage), Mritgarbha or may cause deformed garbha formation and congenital anomalies like suchi mukh uterus in female fetus and sterile progeny.

Shukra (seminal fluid including spermatozoa)

From the etiological aspect, the substance that is liquid in consistency like exudates, have white or silver appearance is known as Shukra [3] Shukra is Saumya because of dominance of Jala Mahabhuta [4]. As per different Ayurvedic scholars Shukra is thick, sweet and unctuous and like the lustre of rock crystals and without any putrid smell, heavy, slimy, white and in large quantity, having the smell of honey or lustre of sesame seed oil or having the lustre of Ghrita, honey or oil invariably helps in procreation of offspring [5-7]. The milky appearance of Shukra is due to prostatic fluid and thick sticky appearance is due to seminal vesicles fluid. Acharya Caraka explained the process of Shukra formation and said that Shukra is seventh in order of formation of Sapta dhatu and produced as a result of successive evaluative metamorphosis of Rasa-dhatu. It is produced from evolutive metamorphosis of Prasad bhaga (essence part) of Majja dhatu by the action of Shukra dhatvagni on it. From the essence of marrow, semen is produced by Vayu, Akashaa etc. Poreness is produced in bones through which semen comes out like water from the new earthen pot. Semen moves through its carrying vessels in the whole body and propelled with force from sexual act, get displaced and liquefied like Gharita by physical exertion comes out of the urinary passage like water flowing towards the lower surface. Time required for the formation of Shukra from the Rasa dhatu is one-month [8]. Cakrapanidatta has opinions that the production of Shukra is depends on the strength of Dhatvagni of individual. When Dhatvagni is at optimum level, then process of Shukra production occurs at speed of Arci (fire) and produced within eight days, at moderate level, at the speed of Shabda (sound) and produces Shukra dhatu within two to three weeks, at mild level, it takes place at the speed of Jala (water) and it take one month. In humans, the time required for spermatogenesis is 35 days and for the spermatogonium to develop into a mature spermatozoon is approximately 74 days and approximately 300 million sperm cells are

produced daily [9]. According to Acharya Sushruta, functions of Shukra are patience, movement, affection, body strength, sexual excitement and to produce sperm for conception [10].

Artava

For instance, in Ayurvedic classics, the word Artava has been used for many contexts such as for menstrual blood, for ovum, factors responsible for formation of sex of embryo, for female ovarian hormones, for excretions during coitus and for bleeding during pregnancy. The Artava in the form of Stri-bija (ovum), serve the function of reproduction or formation of Garbha (fetus) [10]. Acharya Kashyapa said that the Bijavaha Sira has minute lumen and opening which carry the bijja. That Bijja combined with Shukra to form the Garbha[11]. The Artava is Aganeya has characteristics of Rakta, though dominant Mahabhuta is Tejas [10]. Acharya Bhavaprakash opinion has that

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as like Artava is the seventh dhatu in female as like Shukra in males [12]. Sushruta said that in the one month of time shukra in males and artava in females forms from the rasa dhatu. The Artava combined with the shukra in the female genital tract will produce the Garbha (fetus) [10].

Diet for qualitative male and female bija (ovum and sperm) prescribed in ayurveda

In Ayurvedic literature different Acharyas have prescribed different types of diet for increasing quality of gametocytes. In Atharveda, the description found about the milk that milk is most beneficial diet (used the term amrita) for Shukra production [13]. Acharya Caraka mentioned diet to get excellent progeny Gharita (clarified butter) and Ksheera(milk) medicated with sweet groups of drugs for men and masha (black gram) and Tila taila (sesame oil) for the women[14]. Achrya Kasyapa mentioned that the Ghrita (clarified butter) is said to be best to increase Sukra (sperm/ spermatic fluid) in oligospermia and also to the infertile women and adolescents. It increases the chance of conception and then at the end it is nourishing to the fetus [15]. Achrya Caraka also mentioned that fat is beneficial for gynaecological disorders and increases virility, while marrow increases energy, Rasa and Shukra.

Various eatable articles i.e. food grains, cereals, vegetables onion, garlic, tubers, sesame oil, black gram, coocked rice, milk, clarified butter, butter, sugarcane juice and vastuka and cillaka etc. green vegetables are considered to be beneficial to increasing process gametogenesis and quality of gametes. According to Achrya Kasyapa the marrow and fat especially suppress vayu, are considered aphrodisiac, being wholesome to strong person, provide progeny, strength and longevity [15]. Acharyas mentioned that the fat is beneficial for gynecological disorders and increases virility, while marrow is beneficial for formation of Rasa and Shukra. Many other items such as meat especially the eggs of pea hen, hen, swan, saras cranes, meats of aquatic and semi aquatic animals and birds is said to be best to increase Shukra (sperm/ spermatic fluid) in oligospermia and also to the infertile women and adolescents. Meat increases the chance of conception and then at the end it is nourishing to the fetus and for pregnant women it is best pacifier of Vata. Along the beneficial diet a detail description also available in classical literature about the harmful and restricts diet. Food and drinks that possessing tastes of pungent, sour, bitter, hot, dry and causing burning sensation, dry ginger and surana like other articles are harmful for Shukra (spermatocytes). Dicot cereals, articles causing burning sensation, heavy digestible articles, sour item, surana, garlic, ginger are harmful for women [16,17]. Most repetitively prescribed diet in Ayurvedic literature by different scholars are the food consisting of ghee, milk mentioned to be getting a good offspring for men and food consisting chiefly oil of sesame and masha/black gram for the women.

Diet for qualitative sperm as per modern medical science

As per modern medical science in comparison with other macronutrient classes (carbohydrates and protein), the lipids are the most crucial elements for the production of healthy spermatozoon. Fats facilitate the take-up of crucial elements for our diet and serve as sources of energy and carriers of fat-soluble vitamins. Fats also supply essential fatty acids that are vital constituents of cell membranes and Phospholipids and cholesterol are major components which form the lipid bilayer of cell membranes. The normal structure of the sperm membrane is crucial for successful fertilization as both the acrosome reaction and sperm-oocyte fusion are membrane-associated events. Therefore, alteration of polyunsaturated fatty acid composition in sperm could have an adverse effect on its biochemical properties and functional characteristics. As the sperm membrane constitutes of a high content of unsaturated fatty acids and a lack of cytoplasmic enzymes which protects it from the attack of reactive oxygen species, spermatozoa are very vulnerable to peroxidative damage which might impair membrane fluidity. Since sperm cells are susceptible to free radical damage, defense mechanisms in sperm cells are important to neutralize the toxic intermediates. SOD is the major enzymatic defense against lipid peroxidation and contributes to the prevention of peroxidative damages by dismasting the super-oxide anion radical into hydrogen peroxide. Findings indicated that PUFA supplementation stimulates SOD activity which is related to high sperm viability. Furthermore, authors reported that decreased levels of DHA and PUFA and ratio of n-3 to n-6 fatty acids in spermatozoa may be closely associated with infertility in oligo- and/or astheno-zoospermic men. Compared to normozoospermic men, the level of DHA in seminal plasma and the ratio of omega-3 to omega-6 fatty acids in sperm of asthenozoospermic men are much lower. The result of an excessive breakdown of PUFA induced by a high level of reactive oxygen species (ROS). It is also suggested that a high concentration of DHA in both ejaculate and spermatozoa has a positive influence on membrane fluidity which is necessary for sperm motility in humans. Since various findings have demonstrated the ameliorative characteristics of PUFAs supplementation on normal sperm structure, production and function, it can be speculated that PUFAs dietary supplementation might provide a suitable therapeutic nutrition in treating male infertility [18-26].

Research findings suggested that deficiency of essential fatty acids in male rats induce testis degeneration and infertility. Supplementation of precursors to omega3 fatty acids, like cod liver oil or flaxseed oil to stallion has shown an increase of the overall level of omega-3 fatty acids in semen, but did not result in the improvement of semen quality. However, experimental results using boars resulted in a higher DHA to DPA ratio in semen together with an improvement of sperm number, sperm concentration, sperm motility, sperm morphology and sperm viability.

Provision of tuna oil exhibited an increase of DHA and a diminution of DPA in sperm phospholipid fatty acids in human sperm after 5 weeks. The supplementation of tuna oil not only improved sperm progressive motility and normal acrosome scores, but also reduced abnormal morphological spermatozoa. DHA is crucial in promoting optimal fertility especially in human spermatozoa as it shows significant influence on sperm concentration, motility and normal morphology. In contrast, in another research about the effect of DHA supplementation on sperm motility in asthenozoospermic males, results indicated that even though DHA levels increase in serum and seminal plasma, DHA supplementation had no positive influence on sperm motility.

Diet for qualitative ovum as per modern medical science

As per view of modern medical science, in comparison with other macronutrient classes (carbohydrates and protein), fatty acids yield the most ATP by the βoxidation pathway. Triglycerides mainly palmitic, stearic, oleic and linoleic acids are the most abundant intracellular fatty acids in oocytes, constituting over 50% of all lipid material and provide a large potential energy reserve. Lipid droplets accumulate during oocyte growth and undergo temporal and spatial changes during maturation. Lipid droplets become larger and more centrally located and that perlipin-2 and adipose differentiation-related protein (ADRP) surrounds lipid droplets which control the stabilization of lipid droplets and lipolysis for utilization. Lipase enzymes cleave triglycerides into a glycerol backbone and fatty acids with different chain lengths and saturation degrees. Fatty acid uptake is primarily *via* fatty acid protein transporters on the cell surface, including Fatty Acid Translocase (FAT), tissue-specific Fatty Acid Transport Proteins (FATP) and plasma membrane bound Fatty Acid Binding Protein (FABPpm). Once inside the cell, fatty acids are transported across the outer mitochondrial membrane by Carnitine-Palmitoyl Transferase (CPT) and then couriered across the inner mitochondrial membrane by carnitine. In mitochondria, the long chain acyl-CoA enters the fatty acid βoxidation pathway, releasing acetyl-CoA. This acetyl- CoA then enters the TCA cycle to produce ATP. If inhibition of CPT1 occurs, then βoxidation of fatty acids is block during oocyte maturation led to a fall in viability of subsequent embryos due to pauses of meiotic division. In addition, lipase activity and CPT1 expression oocytes following hormonal disturb ovulation. The supplementation of L-carnitine (a cofactor of CPT1), enhanced βoxidation and improved both oocyte nuclear and cytoplasmic maturation. Similarly, L-carnitine increased the concentration of glutathione (an antioxidant) and promoted oocyte development. The metabolism of fatty acids, specifically βoxidation pathway, is essential for maintaining developmental competence of oocytes.

In addition to the energy supply for cells, fatty acids and their precursors/ metabolites have also been reported to be required for the non-metabolic processes, particularly cellular signaling transduction. Diacylglycerol (DAG), an intermediate in glycerolipid metabolism, known as lipid second messenger generated by the lipid hydrolysis of phosphatidylinositol (4,5)-bisphosphate and

protein kinase C (PKC). The binding of DAG to a conserved C1 domain in PKC leads to PKC activation, modulating the cell cycle (such as meiotic resumption, spindle organization and activation), cellular survival, malignant transformation and apoptosis. Ceramide, the immediate lipid product of sphingomyelin hydrolysis, behave as a bio effector for meiotic cycle progression in oocytes Fatty acids also bind nuclear receptors and transcription factors, such as peroxisome- proliferator activated receptors (PPAR) and sterol-regulatory element binding protein (SREBP) [27-32].

Results and Discussion

The most repetitively prescribed diet in Ayurvedic literature by different scholars are the food consisting of ghee, milk mentioned to be getting a good offspring for men and food consisting chiefly oil of sesame and masha/black gram for the women. In the description about the Shukra, the Acharyas mentioned the properties and composition of the Shukra such as has Shukra dominance of Jala-mahabuta so it is drava (liquid) and soumaya in nature, unctuous, madhura (sweet), likewise the milk and ghee (clarified butter) also have similar properties of Shukra. As per the principle of line of treatment in Ayurveda the substance (dravya) which have similar panchabhautica composition and properties they will increase the similar dhatu, dosha and mala in the body. So, the milk and ghee (clarified butter) increase the Shukra dhatu in the body by their similar composition and properties. As per the modern medical science in the process of spermatogenesis most required elements are fatty acids and cholesterol that are present in milk and ghee (clarified butter) in highest ratio.

The properties of gharita (clarified butter)

According to Acharya Sushruta all varieties of Ghrita is sweet in taste, cold in potency, soft, lubricating, moisturise the body tissue, best in mental illness, best suitable to enhance spermatogenesis, decreases vata, pitta and increases kapha, destroy poisons, antiseptic and increase strength and life span. Acharya Caraka also has same opinion that Ghee decreases vata, pita and increases rasa dhatu (nutrients circulating within the body fluid), shukra dhatu (semen) and ojas (essence of body tissue) in the body. Acharya Vaghbatta II said that the ghee is best substances for the improving intelligence, memory, ingenuity, keenness of digestion, longevity, semen (spermatogenesis) and eye sight [33-38]

Ghee could be in liquid, semisolid and sometimes in solid state based on the storage temperature. Ghee made from buffalo milk is whitish with greenish tinge and that of cow milk is golden yellow colour. It is usually prepared form cow milk, buffalo milk or mixed milk [36].

Composition: Ghee is a complex lipid of glycerides (majorly triglycerides), free fatty acids, phospholipids, sterols, sterol esters, fat soluble vitamins, carbonyls, hydrocarbons, carotenoids, (only in ghee derived from cow milk). Its detailed chemical composition is given in (Table 1).

The properties of cow milk

According to Acharya Caraka, milk is generally sweet, unctuous, oily, cool, lactogenic, nourishing, strengthening, revitalizing, homologous to body tissue specially to Shukra dhatu (semen), appetiser, healing and provides mental strength. Therapeutically it can be used in diseases of shukra (male reproductive fluid, depleted sperm count), diarrhoea, fever, hyperacidity and other vata pita diseases. Acharya Sushruta also have same opinion that all varieties of milk are not forbidden for use by all living beings, because of its habituation by birth; increase physical and mental strength, increase ojas (essence of all tissue), rejuvenators, prolongs life span, increase shukra (semen) because of identical properties, increase sexual prowess, best for all age group of peoples. Acharya Vaghbatta II said that the cow milk promotes intelligence, strength and rejuvenator enhances semen (spermatogenesis) [34-38].

Gross composition of cow Milk

The major constituent of milk is water which ranges from 85.5% to 88.7%. Lactose, the milk sugar, is high in its concentration ranging from 3.8% to 5.3%. There is considerable variation in fat content and it ranges from 2.4% to 5.5%. Organic acids and other miscellaneous substance such as vitamins, citrate, etc. play a vital role both in the nutrition of the young calves and in humans (Table 2).

Milk fat contains at least 500 fatty acids and fatty acid derivatives with 4 – 20 or more carbon atoms in their chain. The fatty acid may saturated or unsaturated and usually contains an even number of carbon atoms. Composition of fatty acid also varies between buffalo milk fat and cow milk fat.

In Ayurveda the most repetitively prescribed diet consisting chiefly oil of sesame and masha/black gram for the women to increase Artava. In the description about the Artava the Acharyas mentioned the properties and composition of the Artavaa such as has Artava dominance of Agni-mahabuta so it has all the properties of Agni, likewise the sesame oil and masha/black gram also have similar properties of Artava. As per the principle of line of treatment in Ayurveda the substance (dravya) which have similar panchabhautica composition and properties they will increase the similar dhatu, dosha and mala in the body. So, the sesame oil and masha/black gram increase the Artava in the body by their similar composition and properties. As per the modern medical science in the process of Oogenesis most required elements are fatty acids that are present in sesame oil and masha/black gram in highest ratio [39].

The properties of masha (black gram)

Acharya Caraka mentioned the properties of the masha (blace gram) that it has Vrishaya (aphrodisiac), balance vata to a great extent, oily, unctuous, hot in potency, sweet in taste, heavy to digest, improve strength and improves fertility quickly. Acharya Sushruta said that the Masha is heavy in digestion, unctuous, hot in potency, aphrodisiac, sweet in taste, mitigates vata and increase kapha and pitta, nourishing, increasing strength, breastmilk, it promotes the process of gametogenesis. According to Acharya Vaghbatta II, black gram is unctuous. It promotes strength, kapha, faecal matter and pitta. It is laxative, not easy to digest, hot in potency, sweet in taste. It actuates vata, leads to increase the process of gametogenesis to a great extent. So, all the Acharyas mentioned the masha have the Vrishaya (aphrodisiac), leads to increase the process of gametogenesis to a great extent due to it have similar properties of the Artava [34-38]. As we show the chemical composition of black gram the major fatty acid present in it that are most essential nutritive elements for oogenesis. The black gram has major fatty acids such as linoleic acid, oleic acid, stearic acid, palmitic acid, Alpha linolenic acid, arachidic acid and Behenic acid in high percentage [39,40] The fatty acid composition of black gram varieties given in (Table 3).

Table 1. Showing the chemical composition of ghee.

Constituents	Cow Milk Ghee	Buffalo Milk Ghee
Fat (%)	99 – 99.5	99–99.5
Moisture (%)	<0.5	<0.5
Carotene (mg/g)	3.2-7.4	-
Vitamin A (IU/g)	19-34	17-38
Cholesterol (mg/100g)	302–362	209–312
Tocopherol (mg/g)	26–48	18–31
Free fatty acid (%)	2.8	2.8

Table 2. Showing gross composition of cow milk.

Component	Average Content Percentage (w/w)	Range Percentage (w/w)	Average % of Dry Matter
Water	87.3	85.5-88.7	
Solids not fat	8.8	7.9-10.0	69
Lactose	4.6	3.8-5.3	36
Fat	3.9	2.4-5.5	31
Protein	3.25	2.3-4.4	26
Casein	2.6	1.7-3.5	20
Mineral substances	0.65	0.53-0.80	5.1
Organic acids	0.18	-	1.4
Miscellaneous	0.14	-	1.1

Table 3. Showing fatty acid composition of ghee.

Fatty Acid (%)	Buffalo Milk Fat	Cow Milk Fat
Butyric	4.4	3.2
Caproic	1.5	2.1
Capric	1.3	2.6
Lauric	1.8	2.8
Myristic	10.8	11.9
Palmitic	33.1	30.6
Stearic	12.0	10.1
Oleic	27.2	27.4
Linoleic	1.5	1.5
Linolenic	0.5	0.6

Table 4. Fatty acid composition of sesame seed oil.

Fatty Acid Name	Content (%)
Myrristic (14:0)	0.0-0.1
Palmitic (16:0)	7.0-10
Palmitoleic (16:1)	0.1-0.2
Stearic (18:0)	4-6
Oleic (18:1)	33-44
Linoleic (18:2)	40-50
Linolenic (18:3)	0.3-0.5
Arachidic (20:0)	0.3-0.5
Behenic (22:0)	0.0-0.3
Lignoceric (24:0)	0.0-03

The properties of tila taila (sesame seed oil)

Acharya Caraka mentioned that the properties tila taila that is similar to the properties of Artava such as the tila taila is snigdha (unctuous), hot in potency, sweet, bitter, astringent and pungent taste, strength promoting. It alleviates the vitiation of vata and aggravates pitta and kapha.

According to Acharya Sushruta the tila taila is fire like in properties, hot in potency, penetrating, sweet in taste and madhura vipaka, stoutening, nourishing, spreading throughout the body quickly, entering throught minute pores, dry, heavy in digestion, laxative, causes flexibility of the joints, is aphrodisiac cleanse the skin, promotes intelligence, softness, stability of muscle, colour and strength of the body, remove obstructions, sacrificing has bitter and astringent as secondary taste, decrease vata, kapha, kills worms, produces pitta, purifiers the uterus, best suited for enhancing gametogenesis, pouring over the body parts, subsides pain of the vagina [34-38].

Sesame seed is rich in oil, contains high amounts of (83-90%) unsaturated fatty acids, mainly linoleic acid (37-47%), oleic acid (35-43%), palmitic (9-11%) and stearic acid (5-10%) with trace amount of linolenic acid. Sesame seed oil is highly unsaturated oil. Linoleic acid which is a polyunsaturated fatty acid (see Fact Sheet FAPC-196, Lipid Glossary) is the main oil component comprising about 40% to 50% of the all-fatty acids present in the oil. Linoleic acid is an essential fatty acid meaning that human body cannot synthesize it; hence, it needs to be provided in the diet to maintain good health. Oleic acid, which is a monounsaturated fatty acid more stable than linoleic acid, is the second-most abundant fatty acid in sesame seed oil (Table 4) showing the fatty acids present in sesame oil.

Conclusion

Most repetitively prescribed diet in Ayurvedic literature by different scholars are the food consisting of ghee, milk mentioned to be getting a good offspring for men and food consisting chiefly oil of sesame and masha/black gram for the women. Similar description available in the modern medical science, the development of germ cells requires nutrients mainly glycogen, lipids and cholesterols (from HDL) and specific metabolites lactate and pyruvates, to be used as a substrate for ATP production and division of cells in gametogenesis. Lipids and cholesterols are essential for spermatogenesis as they serve as 'fuel' for Sertoli cells and are crucial for the membrane remodeling of developing germ cells. The cholesterol is obtained from HDL primarily through apolipoprotein E-dependent pathways, phagocytosed apoptotic germ cells, lipid-rich remnant recycling and storage in lipid droplets. Steroidogenesis also requires large amounts of cholesterol while in the seminiferous tubules; cholesterol is required for the differentiation of germinal cells to spermatozoa (gametogenesis/spermatogenesis). Considerable evidence also indicates that, in males and females, cholesterol is required for the development of gametes. While for oogenesis the consumption of oil (sesame oil) and masha (black grain) is recommended as these fulfil the calorie requirement and essential molecular requirement for oogenesis.

Nutrition of parents (deficiencies or excesses in a range of macro- and micronutrients) imbalance disrupts energy metabolism in oocytes and sperm also associated with significant impairments in reproductive performance, fertility, fetal development and long-term offspring health. This disruption further contributes to reproductive problems *via* the metabolic control of meiosis, mitochondria, or epigenetic modifications. The malformed gametes which in turn lead to Garbhsrava (misscarriage), Mritgarbha or may cause deformed garbha formation and congenital anomalies like suchi mukh uterus in female fetus and sterile progeny.

References

1. Agnivesa, Caraka Samhita and Sharira Sthana. Vidhoydhani hindi translation, Chapter 4, 3rd (edn), 2013, Varanasi, India.
2. Agnivesa, Caraka Samhita and Sharira Sthana. Chapter 8, 3rd (edn), 2013, Varanasi, India.
3. https://chaukhamba.co.in/index.php?route=product/manufacturer/info&manufacturer_id=37
4. Sushrut, Sushrut Samhita Sutra Sthana. Chapter 14, 11th (edn), 1997, Varanasi, India.
5. Sushrut, Sushrut Samhita Sharira Sthana. Ayurveda tattvasandipika hindi commentary Chapter 2, 11th (edn), 1997, Varanasi, India.
6. Agnivesa, Caraka Samhita and Chikitsa Sthana. Vidhoydhani hindi translation Chapter 30, 3rd (edn), 2013, Varanasi, India.
7. Vagbhata,Astanga Hrdaya. Text English translation, Vol. I-III, 1991, Varanasi, India
8. Agnivesa, Caraka Samhita and Chikitsa Sthana. Vidhoydhani hindi translation Chapter 15, 3rd (edn), 2013, Varanasi, India.
9. Walton, Arthur. "Spermatogenesis and nutrition." *Br J Nutr* 3 (1949): 83-86.
10. Sushrut, Sushrut Samhita Sutra Sthana. ayurveda tattvasandipika hindi commentary, Chapter 15, 11th (edn), 1997, Varanasi, India
11. Sharma, Akanksha, Pooja Sabharwal and Rima Dada. "Herbal medicine: An introduction to its history." *Herbal Med Androl*, (2021): 1-8.
12. Murty, K.R. Srikantha and Bhav prakash samhita. English Commentary, 1st (edn), 1998, Varanasi, India.
13. Chand, Devi and Mohan C. Joshi. "The Atharvaveda: Sanskrit text with english translation." (1982).
14. Agnivesa, Caraka Samhita and Sharira Sthana. Vidhoydhani hindi translation Chapter 8, 3rd (edn), 2013, Varanasi, India.
15. https://www.researchgate.net/publication/282807479_Dhupakalpadhyaya_of_Kashyapa_Samhita
16. Murty, K.R. Srikantha and Bhav prakash samhita. English Commentary, Vol 1, 1st (edn), 1998, Varanasi, India.
17. Bhela, Bhēla Samhita; Published by C.C.I.M&H, 1997, New Delhi, India.
18. https://www.researchgate.net/publication/2217036
19. Giahi, Ladan, Shayan Mohammadmoradi, Aida Javidan and Mohammad Reza Sadeghi. "Nutritional modifications in male infertility: A systematic review covering 2 decades." *Nutr Rev* 74 (2016): 118-130.

20. Sharma, Hari, Xiaoying Zhang and Chandradhar Dwivedi. "The effect of ghee (clarified butter) on serum lipid levels and microsomal lipid peroxidation." *Ayu* 31 (2010): 134.
21. Hassanzadeh-Taheri, Mohammadmehdi, Farnaz Jahani, Mahsa Hassanzadeh-Taheri and Mohammadreza Doostabadi, et al. "The impacts of yoghurt butter oil on rat testicular morphology and sexual hormones in a 150-day study." *Comp Clin Pathol* 27 (2018): 959-965.
22. Gupta, R. S. and V. P. Dixit. "Effect of dietary cholesterol on spermatogenesis." *Z Ernahrungswiss* 27 (1988): 236-243.\
23. Shi, Jin-Feng, Yu-Kun Li, Kun Ren and Yuan-Jie Xie, et al. "Characterization of cholesterol metabolism in Sertoli cells and spermatogenesis." *Mol Med Rep* 17 (2018): 705-713.
24. Sèdes, Lauriane, Laura Thirouard, Salwan Maqdasy and Manon Garcia, et al. "Cholesterol: A gatekeeper of male fertility?." *Front Endocrinol* 9 (2018): 369.
25. Maboundou, Jean-Claude, Mohamed Fofana, Jacqueline Fresnel and Jean Bocquet, et al. "Effect of lipoproteins on cholesterol synthesis in rat Sertoli cells." *Biochem Cell Biol* 73 (1995): 67-72.
26. Wheeler, Diana. "The role of nourishment in oogenesis." *Annu Rev Entomol* 41 (1996): 407-431.
27. Dumollard, Rémi, Michael Duchen and John Carroll. "The role of mitochondrial function in the oocyte and embryo." *Curr Top Dev Biol* 77 (2007): 21-49.
28. Van Blerkom, Jonathan. "Mitochondria in human oogenesis and preimplantation embryogenesis: Engines of metabolism, ionic regulation and developmental competence." *Reproduction* 128 (2004): 269-280.
29. Johnson, Mark T., Edward A. Freeman, David K. Gardner and Patricia A. Hunt. "Oxidative metabolism of pyruvate is required for meiotic maturation of murine oocytes *in vivo*." *Biol Reprod* 77 (2007): 2-8.
30. Gu, Ling, Honglin Liu, Xi Gu and Christina Boots, et al. "Metabolic control of oocyte development: Linking maternal nutrition and reproductive outcomes." *Cell Mol Life Sci* 72 (2015): 251-271.
31. Ashworth, Cheryl J., Luiza M. Toma and Morag G. Hunter. "Nutritional effects on oocyte and embryo development in mammals: Implications for reproductive efficiency and environmental sustainability." *Philos Trans R Soc Lond B Biol Sci* 364 (2009): 3351-3361.
32. ESHRE Capri Workshop Group. "Nutrition and reproduction in women." *Hum Reprod* 12 (2006): 193-207.
33. Agnivesa, Caraka Samhita, Sutra Sthana. Vidhoydhani hindi translation, Chapter 26, 3rd (edn), 2013, Varanasi, India.
34. Vagbhata, Astanga hrdaya. Text English translation, Vol. I-III, 1991, Varanasi, India.\
35. Christie, J. Anita and S. Geet Andrea. "Therapeutic potential of different probiotic foods." *Adv Prob* (2021): 449-477.
36. R.P. Aneja. "Fatty acid composition of ghee." Fat rich dairy products (2013): 186.
37. Sushrut, Sushrut Samhita Sutra Sthana. ayurveda tattvasandipika hindi commentary, Chapter 14, 11th (edn), 1997, Varanasi, India.
38. Jenness, Robert. "Composition of milk." *Fund dairy chem* (1988): 1-38.
39. Kavitha, B., G. Hemalatha, S. Kanchana and S. P. Sundaram, et al. "Physicochemical, functional, pasting properties and nutritional composition of selected black gram (*P. mungo* L.) varieties." *Indian J Sci Technol* 6 (2013): 5386-5394.
40. https://extension.okstate.edu/fact- sheets/sesame-seed-oil-properties.html

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