TANG [HUMANITAS MEDICINE]

Review article

A scientific understanding of Mammary gland and physiology of lactation in Ayurveda.

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ABSTRACT

Ayurveda scholars have well described about the physio-anatomical aspect of mammary gland (*Stana*) , physiology of lactation, importance of breast milk (*Stanya*) in growth and development of baby, various factors affecting the lactation and causing changes in property of milk, Galactogouge (*Stanyajanana*), and drugs for purification of mother milk (*Stanya Shodhana*). The recent studies provide evidence for above descriptions of Ayurveda. Breast milk (*Stanya*) is the nearly complete sole source of nourishment for infants. It has been considered as subsidiary tissue (*Upadhatu*) of blood plasma (*Rasa Dhatu*) as it is formed out of *Rasa Dhatu* (Plasma) and its quality and quantity gets affected by quality of nutrient fraction of food formed after complete digestion (*Aahar Rasa*). It provides health (*Aarogya*), strength and immunity (*Bala*) to the feeding child and gives innumerable beneficial effects like protection against not only acute infections like URTI, diarrhoea but also on chronic illnesses like CVD, metabolic disorders too. The Ayurveda description related to Mammary gland and physiology of lactation still need a better understanding for its implementation on promotion of health. Thus an attempt has been made to compile and analyze the view of Ayurveda scholars on Breast (*Stana*), Breast milk (*Stanya*) and physiological aspect of lactation as well as to draw a possible scientific understanding for the relevance.

Keywords: Ayurveda, *Stanya*, *Stana,* lactation, *Rasa*, nutrition.

INTRODUCTION

Food (*Aahara*) has been termed as life (*Prana*) due to its outstanding role in sustenance of life of human. Nutrition gets started from the commencement of life itself. In early stage of life, human nutrition is passive i.e. fetus and infants are dependent on mother for their nourishment. Ayurveda scholars *Charak* and *Kashyap* have described that the nutrient fraction of food (*Aahara Rasa*) produced after the complete digestion in pregnant female gets divided into three parts to provide nourishment to the maternal body, breast tissue (*Stana*), developing fetus, as well as to the breast milk(*Stanya*) (Charaka Samhita Sharirasthana, 6/23; Kashyapa Samhita Sutrasthana 18/6-7). After birth up to the *Ksheerad* (baby taking only milk as food) phase of child life, nutrition is solely provided through mother milk. Maternal milk has numerous beneficial effects not only during infancy period but also in later phase of life too. It provides protection against acute as well as chronic diseases, having an important role in neurological and immunological development etc. (Francesca Bravi *et al.,* 2016; Sheila M Innis *et al.,* 2014). Ayurveda compendia have also considered that mother milk (*Stanya*) provides health (*Arogya*), immunity and strength (*Bala*) and nourishment (*Pushti*) to the baby (Charak Samhita Sharirasthana, 8/54; Sushruta Samhita Sharirasthana 10/31). In the whole description of this manuscript the word '*Stana*' means breast whereas '*Stanya*' means mother's breast milk. Ayurveda Scholars have deep insights regarding the anatomical and physiological aspect of breast, physiology of lactation, which has not been explored systematically in view of contemporary science. Thus an attempt is being made to assemble the Ayurveda notion on breast milk physiology as well as to draw a possible scientific understanding for its relevance.

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MATERIAL AND METHODS

Ayurveda texts were thoroughly searched for the literature related to mammary gland (*Stana*) and lactation (*Stanya*), along with this, contemporary researches and texts for supporting the relevancy of description in Ayurveda text.

REVIEW & DISCUSSION

Physio-anatomy of mammary gland (*Stana*)

Ayurveda scholar *Sharangdhara* has named breast (*Stana*) as reservoir of milk (*Stanyashy*a), this description shows that breasts are the organs related to milk formation and lactation, which are two in numbers (Sharangdhara Samhita Purvakhanda 5/10; Charak Samhita Sharirasthana 7/11).

Sushruta has mentioned about the two blood vessels supplying to breast (*Stanyavaha Dhamani*) and ten muscles related to breast, which increases in size at puberty are found only in females (Sushruta Samhita Sharirasthana 9/5; 5/39). These muscles are five in each breast and can be understood as muscles related to breast as muscles around areola, muscles of

nipple, myoepithelial cells, suspensory ligament of cooper, columnar epithelia of alveolus. In *Visrapanadistanarogani-danam* chapter *Sushruta* has described about *Dhamani* which are in constricted or unopen (*Samvrita*) state in young or non-pregnant women so the *Dosha* do not get spread into breast tissues and do not produce disease of breast (Sushruta Samhita Nidanasthana 10/16). In this description the *Samvrita Dhamani* can be understood as lactiferous duct and lobules in breast which is not developed properly in female child or non pregnant women, whereas it gets developed in pregnant and lactating women naturally (in due course of time), becomes dilated (*Vivrita*) and allow the movement of *Dosha* through the breast tissue that may cause diseases in breast like abscess (*Vidradhi or Nadivrana*). This description refers to Mammogenesis i.e. development of alveoli and alveolar ducts under the influence of estrogen and progesterone hormones.

Breast (*Stana*) has been considered as root (*Moola*) of organs involved in formation and nourishment of gametes (*Shukravaha Srotas*) (Sushruta Samhita Sharirasthana 9/12). It is due to the fact that gonadal hormones have influence on breast tissues. The growth and development of breast is under influence of estrogen and progesterone while milk formation and milk letting is regulated by prolactin and oxytocin. Moreover the optimal functioning of these sex hormones can be assessed by clinical examination of mammary gland for example development of secondary sexual characteristics at the time of puberty can be determined by examining the growth and development of mammary gland. Further any abnormality in these hormones affects the mammary gland structurally as well as functionally. Acharya Charak while describing *Shandi Yonivyapada* (a disorder of female genital organs), has mentioned that vitiated sperm (*Shukra*) and ova (*Aartva*) vitiates the uterus (*Garbhashaya*) of female fetus with *Vata Dosha* leading to non-development of mammary gland after birth (Charak Samhita Chikitsasthana 30/34). These types of females do not possess *Stana* (undeveloped breast) as well as *Aartva* (ova, menstruation) (Sushruta Samhita Uttartantra 38/18). These descriptions suggest that Ayurveda scholars have described breast (*Stana*) as not only an organ associated with milk production for nourishment of baby but also as structure reflecting the manifestations of secondary sexual character. Thus the Ayurveda scholars have described about the detailed anatomical aspect development of breast including growth of ductal and alveolar system of breast tissue, blood supply etc.

Preparation of mammary gland for lactation

Ayurveda physicians have not only discussed the formation of breast milk but they have also mentioned some features indicating growth and development of mammary gland. While describing the various features of early state of pregnancy (*Sadyograhita Garbha*), changes in breast tissues i.e. blackish discoloration of nipple and areola of breast, appearance of milk in breast (*Stana*) have been mentioned. (Sushruta Samhita Sharirasthana 3/14-15; Charak Samhita Sharirasthana 4/16) It has been also mentioned that attainment of pregnancy leads to amenorrhea (*Anartava*), development of placenta (*Apara*) as well as mammary gland due to obstruction of *Aartavavaha Srotas* (Sushuta Samhita Sharirasthana 4/24). The obstruction of *Aartavavaha Srotas* (female reproductive system) refers to amenorrhea due to hormones produced by corpus luteum and placenta after conception in pregnancy that also cause development of breast i.e. prepares it for lactation.

Lacto- genesis (milk formation)

Milk ejection gets started after three or four days of delivery due to dilatation of *Dhamani* at *Hridaya* (Sushruta Samhita Sharirasthana 10/18). This description might be indicating the effect of increased level of progesterone and estrogen which makes the breast tissue unresponsive for the prolactin. After three or four days of delivery, when circulating levels of these hormones are reduced, this effect is withdrawn resulting in synthesis of milk. Dilatation of *Dhamani* in cardiac region might be indicating the filling of milk in lactating tubules of mammary gland.

Causes of milk ejection (Milk letting)

Breast milk (*Stanya*) which has been formed from nutrient fraction of food (*Aahar Rasa*) gets ejected on touch, sight, remembrance of child or on holding the child. Affection of mother towards her child is most important factor for uninterrupted flow of breast milk. The idiom of ejaculation of semen in males has been given to describe the fashion of milk ejection (Sushruta Samhita Nidanasthana 10/14). Secretion of oxytocin hormone, which is responsible for milk ejection, gets increased on sight of baby or hearing the cry of baby (Guyton & Hall, 2014).

Formation of breast milk (lactogenesis)

It has been quoted by Ayurveda physicians that nutrient fraction of food (*Aahar Rasa*) which has been formed after proper digestion, gets circulated to whole body with the help of *Vyana Vata*(a type of *Vata Dosha*) and reaches to mammary glands and gets converted into breast milk (*Stanya*). It can be assumed that formation of adequate quantity and quality of breast milk is determined by the quality of *Aahar Rasa* which depends upon both adequate food and their proper metabolism too (Sushruta Samhita Nidanasthana 10/18). This might be possible reason for considering breast milk (*Stanya*) as subsidiary tissue (*Upadhatu*) of *Rasa Dhatu* (plasma of blood) (Charak Samhita Chikitsasthana 15/15). The quantity of daily production of breast milk (*Stanya*) has been estimated as two *Anjali* i.e. approximately 390ml (a measurement unit for volume, the term Anjali refers to the quantity of substances taken by joining the both palms of self) (Ashtanga Hridaya Sharirasthana 3/81; Ashtanga Sangraha Sharirasthana 5/63). Previous studies have estimated that 94% of term mothers produce approximately 440ml/day by second week (Kent JC *et al.*, 2016; Kent JC *et al.,* 1999).

Characteristics of pure mother milk

Pure milk possess normal color, odor, taste and touch, gets completely dissolved in water. It is sweet (*Madhura*) and astringent (*Kashaya*) in taste unctuous (*Snigdha*) in touch, whitish (*Shankhabha*) in appearance and devoid of foam etc. Such kind of milk provides proper growth and development of body, psyche, strength and provides longevity with disease free state (Charak Samhita Sharirasthana 8/54; Sushruta Samhita Sharirasthana 10/31; Sushruta Samhita Nidanasthana 10/25; Singh BM, 2015). Along with these features of vitiated milk and their effect on health, growth and development of child has been also discussed (Charak Samhita Chikitsathana 30/237-249).A recent study has shown that infants feeding vitiated milk were more likely to suffer from URTI and diarrohea as comparison to those who were having non vitiated milk (Singh D *et al.,* 2019).

Factors affecting quality and quantity of mother milk

Several factors including dietary, psychological and nutritional status of mother have been described which influence the qualitative and quantitative status of milk (Sushruta Samhita Sharirasthana 10/30, Ashtanga Sangraha Uttarsthana 1/24; Charak Samhita Chikitsathana 30/232-236). Studies have reported individual variations in breast milk composition, which are attributed to the stage of lactation, frequency of

infant feeding, the degree of breast fullness, the health of the lactating women, diet and environment, genetic and other factors (Witkowska-Zimny M *et al.,* 2017; Ballard O and Morrow AL, 2013; Hinde K and German JB, 2012).

Dietary factors

The quality of breast milk depends upon the dietary habits of mother like indulgence in incompatible diet (*Viruddha Aahara*), intake of meal before complete digestion (*Adhyashana*) and improper maternal diet will affect the breast milk. All these factors vitiate *Dosha* and *Agni* cause formation of *Aama* (products generated during improper digestion and metabolism) ultimately affecting the quality of *Aahar Rasa* which leads to vitiation of milk.

Psychological factors

Psychological factors like fear, anxiety, anger also vitiate or reduce the breast milk as it leads to imbalance in *Tridosha* which refers stimulation of sympathetic nervous system which in turns reduces oxytocin secretion and depresses milk ejection (Guyton and Hall, 2014). Intravenous injection of high dose of norepinephrine has also shown to reduce milk production and let down reflex. (https://www.ncbi.nlm.nih.gov/books/NBK501682).

Psychosomatic Constitution (*Prakriti*) of Lactating women

Prakriti refers to genetic account of an individual, producing metabolic peculiarity and dietary differences. The dietary intake of mother varies as per their *Prakriti*, leading to variation in breast milk composition

Studies have also reported that the milk composition along with milk synthesis vary among individuals within species (Hinde K and Milligan LM, 2011) potentially with genetic factors (Hinde K and German JB, 2012).

Recent study has shown that, mother indulged in *Dosha* vitiating dietary and behavioral activities were having vitiated milk. These effects were also found to vary as per the maternal *Prakriti*. Significant variation was observed in composition of milk for fat content which was maximum in milk of *Kapha* and *Pitta Prakriti* mother while minimum in *Vata Prakriti* mother (Singh D *et al.,* 2019).

Indication of exclusive breast feeding

Various awareness programs like annual breast feeding week (1-7th August every year) and Mother's absolute affection program are run by certain organizations like WHO, UNICEF to ensure exclusive breast feeding for six months. Ancient Ayurveda scholars have also recommended exclusive breast feeding for six months (Sushruta Samhita Sharirasthana 10/49). The importance of mother milk in growth and development of baby was well appreciated by Ayurveda scholars as best source of nutrition for baby. They have also recommended the breast feed by wet nurse (*Dhatri*) as a substitute in condition of lactation failure or deficient lactation of mother of baby (Sushruta Samhita Sharirasthana 10/22-23).

Contraindication of breast feeding

Mother afflicted with hunger, grief, tiredness, vitiated *Dhatu*, fever, pregnant, obese or emaciated, have consumed incompatible diet (*Viruddha Aahar*), or if the medicine given to the child has not been metabolized as it may lead to increased potency of drug (*Aushadha*) and augmentation of *Dosha*, and waste products (*Mala*) (Sushruta Samhita Sharirasthana 10/31; Ashtanga Sangraha Uttarasthana 1/25). This might be indicating interaction of mother milk with drug. It has been shown that psychological status of mother may influence prolactin or oxytocin synthesis. It has been also shown that increased cortisol concentration during stress in maternal body, may get secreted into mother milk which ultimately influence infant temperament (Grey KR *et al.,* 2012; Sippel LM *et al.,* 2017; Borski RJ *et al*., 2001).

Substitute of breast milk

Alternative resources of milk have been advised whenever there is deficient or no production of milk. Arrangement of *Dhatri* (lactating women, who gives feed to other's baby) as well as cow or goat's milk after processing with drugs like *Laghupan-chamula* or *Shalparni (Desmodium gangeticum)* has been recommended (Ashtanga Hridaya Uttarasthana 1/20). Processing of substitute milk with certain drugs may be done to increase the digestibility of high protein content of cow's milk. Cow's milk hampers not only the iron absorption but also increases the solute renal load. Processing of milk might have a beneficial effect on it (Ekhard E Ziegler, 2011). Goat's milk also have a high folate content and beneficial effect on facilitating the absorption of iron and copper (Barrionuevo M *et al.,* 2002). Advice of Goat's milk indicates that they have deep insights regarding the role of Goat's milk in enhancing absorption of iron and copper thus preventing the iron deficiency anemia.

Indication of Galactogauge (Stnayajanana) and milk purifying (*Stanyashodhana*) Drugs

Certain drugs have been indicated to improve quality and quantity of *Stanya* as *Stanyajanana* and *Stnyashodhana Dravya*. *Stanyajanana Dravya* are *Veerana* (*Acalypha ornta*), *Shaali* (variety of rice), *Shastika* (variety of rice), *Ikshuvalika (Saccharum officinarum), Darbha (Imperata cylindrica), Kusha (Desmostachya bipinnata), Kasha (Saccharum spontaneum), Gundra (Typha angustata), Itkata (Sesbania bispinosa)* and *Katrina (Aloe succotrina)* (Charak Samhita Sutrasthana 4/17). *Stnyashodhana Dravya* are *Patha (Cissampelos pareira), Sunthi (Zingiber officinale), Devdaru (Cedrus deodara), Mustaka (Cyperus rotundus), Murva (Marsdenia tenacissima), Guduchi (Tinospora cordifolia), Vatsakaphala, Kiratikta (Swertia chirata), Katuki (Piccrorhiza Kurroo)* and *Sariva (Hemedismus indicus)* (Charak Samhita Sutrasthana 4/18).

CONCLUSION

Ayurveda scholars have well described about the anatomical and physiological aspect of mammary gland and physiology of lactation, importance of mother milk in growth and development of baby, various factors affecting the lactation and causing changes in property of milk, galactogouge, and drugs for purification of mother milk. The recent studies provide evidence for above descriptions of Ayurveda but still need research for its clinical assessment and therapeutic application.

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CONFLICT OF INTEREST

Authors have no conflict of interest to declare.

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